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WHEN the Supreme Court passed on the commodities clause of the Interstate Commerce Commission two years ago, it said that ownership of stock in a coal company did not give a railway such an interest in the coal produced as to prevent it from lawfully carrying it. In its decision in the Lehigh Valley case just handed down, it goes farther. The principle laid down is clear so far as it goes. The court says that when the railway directs the management of the coal company to such an extent that the entity of the coal company as a corporation is in effect lost, it cannot carry its coal. It would seem to be a question of judgment as to just when the "entity" of the coal corporation is lost; the court says it is when the affairs of the coal company are commingled in administration with the affairs of the railway company so as to make the two corporations virtually one. It is evidently at least lost when the higher officers of the coal company and of the railway company are the same individuals, and when the railway company is supplying the money by which the coal company meets current expenses. In general, its principle is the same as that promulgated in the Galveston Terminal case, where Justice McKenna drew the line between a "holding company which was content to hold," and the condition in which the powers of management given by stock ownership were carried further. Probably this latest decision, which allows the government to bring in an amended suit against the Lehigh Valley, will also leave the way clear for proceeding against other anthracite carriers. They can escape these actions by doing what the Lackawanna has done, that is, distribute the stock of its subsidiary coal company to its own shareholders, who will select their own board of directors and officers, so that the railway as such ceases to have any direct interest in the coal company. This is not desirable from the railway's point of view, because the coal company's stock will not necessarily remain in the hands of the railway's shareholders. In the case of the Lackawanna the stock is more closely held, so that there is less danger of this than there would be with most of the other coal roads.

THE Rock Island recently announced that it will inaugurate a system of giving cash prizes to roadmasters for the purpose of stimulating efficiency in track work. Probably in no other branch of the railway service does the inefficiency of labor cost so much as in the track department. It is universally conceded that the quality of track labor has been steadly deteriorating in intelligence and efficiency for many years; and the railways, generally speaking, have done but little to combat the tendency. The time is quickly coming when some radical measures will have to be adopted to better conditions. While the track structure has developed with the demands of the traffic, the same methods of maintenance are in vogue that were used 20 years ago. The time has come when precedent and custom, or, as it might be called, the "fixed policy" regarding track work, will have to be cast aside. New methods are necessary to meet the new conditions. Means must be devised for increasing efficiency. The system of awarding prizes to the individual foremen whose work shows the greatest improvement for a given period is perhaps the best known and most widely adopted method yet tried. The Pennsylvania and the New York Central have followed this policy for many years. Among other roads following the same general policy are the Queen & Crescent and the Union Pacific, medals being awarded by the latter road. The Santa Fe began an experiment a year ago with the bonus system for roadmasters, foremen and laborers, whereby the saving in maintenance charges is shared with these men. The Union Pacific has established educational courses for track laborers, foreign as well as native, a special course having been prepared for its large number of Japanese laborers. Such plans tend to stimulate efficiency by appealing to the men themselves. Another method is that for providing tools or equipment to reduce the unproductive part of track labor to a minimum. The motor car for section forces is an important device, being widely

employed for this purpose. It enables greater efficiency to be obtained by reducing the unproductive labor used in going to and from work to a minimum; by increasing the length of time employees actually are at work on the track; and by attracting a better class of men. These developments are but indications of the general demand for improvements in this field and of the attention now being paid to the subject. There is scarcely another field of railway endeavor which has so long been allowed to lie fallow or will so richly repay intelligent cultivation.

ON the Union Pacific and allied lines enginemen are trusted to see semaphores; at least to the extent that the flagman at the rear end of a train is allowed to omit the use of torpedoes and fusees in certain circumstances, provided he can see the protecting semaphore and thus be able to testify personally to ocular evidence that the signal was in the stop position in case an engineman should be found to have run past it. This statement, printed in our issue of March 24, has brought out the information from Vice-president Melcher of the Rock Island, and from General Manager Goodell of the Northern Pacific, that "there are others." Both of these roads have substantially the same rule that is in force on the U. P. The rule of the Rock Island reads:

"When a train requires protection within a block controlled by an automatic block signal, and such signal is not less than one-half mile to the rear of the train, the flagman need not go back beyond where the block signal is plainly seen to display 'stop' and he must know that it continues to display 'stop' while the train requires protection."

We are glad to see this rule. Our statement that the Harriman Lines were the only roads having such a rule was given verbatim from a source believed to be authoritative, though we did not use quotation marks. Even with correct knowledge of facts a query sometimes remains. How is it that a brakeman can be trusted to watch an automatic block signal, and be ready effectively to jump in and take the place of it in case it wrongfully changes to clear, while he cannot be so trusted in the case of a signal controlled by a signal man? The real difference between this practice and that prescribed by the ordinary rule seems to be (as we have said) the omission of torpedoes and fusees, for the flag signal given by the brakeman would for all practical purposes be scarcely more than a duplicate of the semaphore indication. To omit the flag is simply to omit an absurdity. A flag can be waved, while the semaphore indication is motionless, but it is doubtful whether the flag, even with that advantage is as good a signal as the post and arm. But perhaps the most interesting question as to this matter of reinforcing the automatic block signal (by having a brakeman watch it) is that suggested by the fact that in hundreds of instances every day trainloads of lives are trusted to unwatched semaphores, following trains being so close together that there is no time to send out a brakeman in case of a sudden and unexpected stop.

IN another column we publish an article by a railway president criticising the opinion written by Commissioner Lane, and rendered by the Interstate Commerce Commission, in the western rate advance case. The strictures passed are severe; but the article accurately reflects the views of most executives of western railways. No doubt this is partly because railway officers are partisans, and are not apt to relish the opinion in any case that goes against them. But it is notable that when the courts decide cases against either the shippers or the railways, the defeated litigants, while they may question the correctness of the conclusions reached, seldom attribute bias to the court that arrived at them. There is one important point about this matter, however, which we think most persons overlook. This is that with the laws as they are, and the commission appointed as it is, it is a practical impossibility for it to be impartial. It is not a court, although its procedure has the similitude of court procedure. It is an adminstrative body. It owes its existence primarily to the provision of the federal constitution which gives Congress the power to *regulate* commerce among the states and with foreign nations, and secondarily to a statute entitled "An Act to *Regulate* Commerce"; and its business is to *regulate* railways and not merely, like that of a court, to apply the law to cases which may come before it. A court does not institute proceedings; but the commission is authorized and required to institute proceedings on its own motion. It must not merely apply, but it must also enforce, the laws under which it acts. In these respects it differs entirely from the English railway commission, which is a court in the strictest sense of the word; which is presided over by judges assigned from the regular courts; and which has not the duty of enforcing the laws at all. Railway officers had just as well reconcile themselves to the fact that, under existing laws, it is improbable that the commission will ever be an entirely impartial body, no matter how much its members may desire, or how strongly they may believe, it to be so. Usually, no doubt, its rulings and decisions are fair; but it is perhaps significant that the number of cases of first-rate importance which it has decided in favor of the railways is small as compared with the number of such cases in which the courts have overruled it. The fault is not that of the commission; a man cannot be at once an efficient prosecutor and an unbiased judge. The fault is with the laws creating the commission, prescribing its duties, fixing its authority and specifying for what terms its members shall be appointed; and we probably shall not have—and perhaps cannot possibly have—entirely fair federal regulation of railways until we shall have a complete revision of these laws.

PRESIDENT DELANO ON ARBITRATION OF RAILWAY LABOR DISPUTES.

WE present elsewhere an interesting and thoughful letter from President Delano of the Wabash, about the arbitration of differences between railway managers and employees over wages and conditions of employment. The discontent he expresses regarding recent settlements is shared by most railway operating officers. As he says the various arbitrations have proved to be "compromises which rarely go deeply into the matter of the principle involved. Unlike decisions of a court, they furnish no useful precedent for future action and are of practically no educational value." An unexpected development is the attitude that railway labor is assuming. Formerly it was the managers who said that they had nothing to arbitrate and the men who insisted on arbitration. Now the managers have become converts to arbitration; and on the other hand, in spite of the fact that every recent arbitration has resulted in an increase of wages, the men refrain from proposing it, and commonly seek to avoid it when it is proposed by the managers. The change raises the query whether they feel that their cause is less just and justifiable than it used to be, or think that the ability of their representatives as negotiators has so increased that they have more to gain by dealing with railway officers directly than indirectly through boards of arbitration.

Mr. Delano's suggestion for a permanent court of arbitration, composed of men largely freed from other responsibilities and chosen for a reasonably long term, is extremely interesting. Certainly, no effort should be spared to prevent strikes on railways in future. Now, serious disputes between employees and managers are certain to continue to arise. Strikes recently have been repeatedly threatened because the managers would not concede as large wage advances as labor demanded. The demand by the railways for more and better work in return for each dollar in wages is going on—and should—grow constantly stronger; and strained relations are apt to result and even lockouts to be threatened, owing to efforts to secure greater efficiency. If serious consequences are to be avoided, means to that end must be provided. Whether the creation of a permanent court of arbitration is the best means available merits serious consideration. It would seem that such a court would be better

adapted to its purpose than are the boards of arbitration which are now formed to settle each of them a different controversy, and which are usually composed of one man representing one side, another representing the opposing side and a third who may be neutral, but who usually has no expert knowledge of the matters in controversy and the surrounding conditions. The great danger is that the proposed court of arbitration might not be a court in fact as well as in name. If it were merely an administrative body with a constantly changing membership and an insatiable appetite of power, it would be susceptible to political influence and popular clamor. In that case, as the railway brotherhoods command more votes than the railway companies, it is easy to foresee what the general tenor of its decisions would be.

The entire subject is one of great importance, and we are glad a discussion of it has been started by Mr. Delano. There can be no question in the mind of any man familiar with existing conditions that the public interest requires that some action shall be taken to bring the railway brotherhoods to the same sense of their duty and responsibility to the public to which government regulation has brought the railways. Time was, not long ago, when as Mr. Delano says, the railway employer exercised an excessive authority with little responsibility. That condition is reversed, and now the railway brotherhood exercises much too great an influence over railway affairs and over the service railways render in proportion to its responsibility. The railway brotherhood has become morally as much a public service institution as the railway corporation; and the public cannot effectively, salutarily or justly regulate the corporation without also extending a firm and controlling hand over the brotherhood.

AN UNSEEN FACTOR IN RAILWAY VALUATION.

IT is not amiss to point out one factor in valuation almost if not quite unseen. It is that element which represents investment extinct and destroyed in the various railway reorganizations. It is unfortunately a branch of the subject where statistics are defective and vague. Certain general facts appear in figures but they cannot be analyzed in detail. The base line of natural computation is the record of bonds and stocks of railways involved in foreclosure sales for 35 years since 1875. These are returned at the enormous sum of $7,240,162,000. But it affords almost no clue to the actual extinction of investment values except so far as one may say that a moderate fraction of so vast an amount must be a great absolute sum. It is also incomplete in time. It does not antedate a point midway in the long and successful period which began with the panic of the autumn of 1873 and which did not fully end until seven years later. Foreclosure sales during the last three years of that period included roads with stocks and bonds amounting to $828,801,000. During the next three years the total was but $250,449,000. For the half dozen years preceding 1876 and including nearly one-half of the long panic period, foreclosures and extinction of investment must have been very large, especially in proportion to the total railway investment of the country at the time.

How large has been the ratio of the total amount in stocks and bonds eliminated in reorganizations is obviously a question that cannot be answered in exact terms but on which some sidelights can be thrown. The case of the railways of the State of Connecticut may be cited as bearing on the point. It is a populous commonwealth with intensive factory industries. It has not been a State where a railway once built has ultimately been reduced, in the old phrase, to "two streaks of iron rust and the right of way," and nearly every line once built has continued in operation. Yet of its eleven original lines of importance four have gone through reorganizations that have involved large loss of original investment. In one case, that of the old Boston, Hartford & Erie, afterward The New York & New England, the extinct securities run far up into the millions. In "town aid" subscriptions to new railway lines—that is to say, municipal subscriptions to stock of projected lines—several millions of hard cash went to the bad in the State; and the "town aid" fever rose to a temperature that had to be lowered by a constitutional amendment absolutely prohibiting aid of the kind. In the case of one minor town aid road after two reorganizations there were three dollars lost by municipalities and private investors to one dollar that survived. The experience of such a commonwealth as Connecticut gives a suggestion of the extinct railway investment in other regions of the country where the rage for railway building that followed the Civil War went to greater extremes and where in many cases State aid was joined to municipal and private subscriptions for new lines which were unduly rated as pledges of immediate prosperity. The reorganized railways, or most of them, remain and have had their share in the upbuilding of localities, particularly when absorbed in great railway systems. But much of the original cash that constructed them survives only in the time-faded stock certificate and as mere relics in the shape of bonds with their dismal appendices of coupons uncashed.

The $7,240,162,000 involved in the railway foreclosures of 35 years has also its historical suggestion. The earlier reorganizations were drastic, and junior securities were snuffed out remorsely. But during the last two or three decades there has come in a "live and let live" theory, not only recognized by reorganizers but by the courts acting through their receivers. Sometimes original stock has been left far outside of new inside liens; but more often reorganization has rested on a stock assessment. Now and then the plan has worked out with unlooked for success. The Union Pacific case, for example, where stock has beaten bonds in prosperity and profit is a conspicuous instance. But in reorganized railways as a whole a great volume of original losses remain.

Where are those losses in the present theory and practice of revaluation? Theoretically they operate to solidify capitalization. The line originally and actually costing say $5,000,000, and honestly capitalized at that amount in stock and bonds, but after a period of adversity bought in at a half or quarter of the first investment and made a subsidiary of a large railway system becomes an important, if unseen and remote, factor in valuation which an estimate of replacement cost should disclose. Practically, however, it is hidden in the general valuation and in the ratio of that valuation to new capitalization in stock and bonds often based on the whole system. It is there, but disguised and covered; and the disguise is complete if the valuation is based on earning power rather than replacement. The unseen factor obviously varies also with different railway systems. One railway system built up rapidly has paid relatively high prices for subsidiaries; another system, slowly expanding, has been more conservative and has waited for weak connecting lines or branches to fall in. One system may adopt the practice of leaseholds; another of purchase; and, finally, subsidiary and component lines acquired far below original cost are partly offset by prosperous lines acquired far above original cost. The margin that remains of "solidification" in favor of the "bedrock" reorganized lines is thus indeterminate. In the case of the four Connecticut roads foreclosed, the reduction on original cost—including equipment—would probably amount to not less than 25 per cent., even allowing for subsequent mortgages and other capitalization. Such a ratio applied to the $7,240,162,000 of stock and bonds of lines included in the foreclosures of the last 35 years would imply an unseen factor of about $1,800,000,000 in a valuation of American railways. Stated in different form, that amount would be a coefficient in raising the valuation of all the steam roads of the country based on replacement. The ratio is probably somewhat too high. It would not allow for duplicate foreclosures and would have to be diminished by the amount of original water in capitalization. On the other hand, the absolute sum would be increased by foreclosures previous to 1876. But whatever its amount and its ratio to actual value, both, as having a real existence, are an interesting subject of speculation. And,

if any general valuation of our railways comes to pass and extinctions of first investment are sought out and aggregated, the now unseen factor will become visible.

THE EFFICIENCY OF RAILWAY EQUIPMENT.

THE average capacity of freight cars and the average tractive power of locomotives have been greatly increased in recent years. Has the work done by equipment increased as much as it should in proportion to the increase in its capacity to do work?

At a time when the railways have just been told by the Interstate Commerce Commission that they must add to their net earnings—if at all—by augmenting the efficiency of their operations, and not by advancing their rates, this is a question both interesting and important. The difficulty of getting a satisfactory answer is great. It cannot be got merely by study of statistics; one must know thoroughly the conditions under which the operations represented by statistics have been carried on before he can safely say that the statistics clearly show one thing or another; if more statisticians always bore this in mind there would be more good statistics and fewer poor statisticians. But, nevertheless a comparison of the increase in the potential ability of equipment to do work with the increase in the work that it has been doing, based on statistics, is interesting and may be instructive. Certainly it will disclose some facts of the existence of which many railway men are unaware.

The following table has been worked out to show the relative increases in the tractive power of locomotives and in the traffic handled by them. The comparisons have been made between the years 1902, 1907 and 1909, because 1902 is the first year for which some of the necessary figures are available; 1907 was the year of largest traffic movement, and 1909 is the last year for which complete statistics of the Interstate Commerce Commission are available.

		1907.		1909.	
	1902.		Per cent. inc. (or dec.) over 1902.		Per cent. inc. (or dec.) over 1902.
Average tractive power per locomotive, lbs.	20,485	25,823	26	26,601	29.9
Average passengers per train	45	51	13	54	20.0
Average tons per train	296.47	357.35	20	362.57	22.0
Ton miles per freight locomotive per year	6,666,499	7,375,585	11	6,447,708	—3.3*
Passengers hauled one mile per passenger locomotive per year	1,908,309	2,163,146	13	2,185,877	14.5
Ton miles per lb. freight locomotive tractive power per year	357.6	289.9	—18*	245.5	—31.3*
Passengers hauled one mile per lb. passenger locomotive tractive power per year	102.4	85.0	—17*	81.9	—20.0*
Locomotive tractive power per mile of line	3,839.5	6,194.7	61	6,388.9	66.4
Tons moved one mile per mile of line per year	793,351	1,052,119	33	953,986	20.2

*Decrease.

The Interstate Commerce Commission gives the numbers of different kinds of locomotives, but it does not give the average tractive powers of the different kinds. It was, therefore, arbitrarily assumed in making the calculations on which certain of the above figures are based that the average tractive power of freight and passenger locomotives is the same. It will be seen that while the increase in the average tractive power of *all* engines between 1902 and 1909 was almost 30 per cent., the increase in the average number of passengers per train was only 20 per cent., and the increase in the average number of tons per train only 22 per cent. To be valuable indices to transportation efficiency, statistics must represent not merely quantities hauled, but also average movement. While the average tractive power of locomotives increased 26 per cent. between 1902 and 1907, the ton miles per freight locomotive per year increased only 11 per cent. While the average tractive power per locomotive increased 30 per cent. between 1902 and 1909, the ton miles per freight locomotive per year decreased 3.3 per cent. Still more striking are the figures showing the number of tons hauled one mile *per pound* of freight locomotive tractive power per year, and the number of passengers hauled one mile *per pound* of passenger locomotive tractive power per year. The ton miles per pound of power decreased from 357.6 in 1902 to 289.9 in 1907, or 18 per cent., and to 245.5 in 1909, a reduction as compared with 1902 of 31.3 per cent. The number of passenger per pound of power in 1902 was 102.4, and in 1907 it was 85, a decrease of 17 per cent., and in 1909 it was 81.9 per cent., a decrease as compared with 1902 of 20 per cent. Locomotive tractive power per mile of line increased 61 per cent. between 1902 and 1907, and 66.4 per cent. between 1902 and 1909. Tons moved one mile per mile of line increased only 33 per cent. between 1902 and 1907, and only 22.2 per cent. between 1902 and 1909. That the increase in the average tractive power of locomotives has taken place faster than the increase in the average traffic moved by them is quite clear.

The following table shows the increases in the capacity of freight cars and in the amount of traffic handled by these freight cars:

		1907.		1909.	
	1902.		Per cent. inc. (or dec.) over 1902.		Per cent. inc. (or dec.) over 1902.
Average capacity per freight car, tons	28	34	21.4	35	25.0
Average ton miles per car mile	11.8	13.82	17.1	12.7	7.97
Average tons moved per loaded car mile	16.9	19.68	16.0	19.3	13.8
Ton miles moved per car per year	101,732	118,801	16.7	105,518	3.7
Ton miles moved per year per ton of car capacity	3,719	3,527	—5.0*	2,992	—19.5*
Average capacity freight cars per mile of line, tons	211.3	294.7	40.0	310.7	47.0
Tons hauled one mile per mile of line	793,351	1,052,119	33.0	953,986	20.2

*Decrease.

It will be seen that the average capacity of freight cars increased 21.4 per cent. between 1902 and 1907, and 25 per cent. between 1902 and 1909. The average ton miles per car mile—including both empty and loaded cars—increased over 17 per cent. between 1902 and 1907, but less than 8 per cent. between 1902 and 1909. These figures reflect the heavy decline in traffic following the panic, resulting in a large increase in empty mileage.

The average tons per loaded car mile increased 16 per cent. between 1902 and 1907, and less than 14 per cent. between 1902 and 1909. The ton miles per car per year increased almost 17 per cent. between 1902 and 1907, but less than 4 per cent. between 1902 and 1909. The ton miles per year per ton of car capacity, which is the unit that really represents the capacity of cars to do work and the work that they do, decreased 5 per cent. between 1902 and 1907, and decreased almost 20 per cent. between 1902 and 1909. This shows that the railways have increased the ability of cars to do work, as well as the ability of engines to do work, faster than they have increased the work done by them.

Perhaps we should exclude from consideration the figures for 1909 as abnormal, because they are the resultant of abnormal conditions. Comparing, then, 1907 with 1902, the total capacity of freight cars increased 58½ per cent., and the ton miles of freight increased only 50.42 per cent. A failure to utilize fully the increased capacity of cars might be due to any or all of the following causes: (1) decrease in the percentage of loaded movement; (2) slower average movement of cars (including the time they are idle from lack of traffic); (3) decrease in the proportion of commodities producing a large ton mileage per car mile; or (4) decrease in average loading efficiency.

The decline in work done as compared with working capacity was not due to the first cause mentioned. The statistics of the commission show that the percentage of loaded car mileage to total car mileage increased from 69.7 per cent. in 1902 to 70.2 per cent. in 1907. It is natural that with an increase in the density of traffic the percentage of loaded mileage should increase, unless there is a greater increase in the

kinds of commodities that use classes of cars which cannot generally be used for return loading. There was a slight increase in commodities of this kind, but it was not sufficient materially to affect the result.

As to the second possible cause referred to, it is probable that there was little difference between the average daily movement of cars in 1902 and in 1907. The statistics of the Interstate Commerce Commission indicate that the average miles per car per day in 1902 were 24.3, and in 1907, 24.5. The statistics of the American Railway Association indicate that the average miles per day in 1902 were 24.1, and in 1907, 24.0.

The third possible cause mentioned—decrease in the proportion handled of commodities producing a large ton mileage per ton of car capacity—also was not operative, for the statistics of the commission show that the percentage of products of mines hauled—which load the heaviest—to the total traffic hauled, increased from 52.36 per cent. in 1902 to 53.39 per cent. in 1907.

The conclusion inevitable is that the increase in the traffic hauled per ton of car capacity was due entirely to a relative decrease in loading efficiency. The percentage of car capacity utilized in loading decreased from 60.36 per cent. in 1902 to 57.94 per cent. in 1907. If the percentage of capacity utilized had been as great in 1907 as in 1902, the load per car in 1907 would have been 20.5, instead of 19.68 tons, and the ton mileage produced by the loaded car miles made would have shown an increase over 1902 of 56.07 per cent., instead of only 52.4 per cent.; or, rather, the car miles necessary to produce the ton miles which actually were produced, would have been less in this proportion.

It might be thought that this relative decrease in loading efficiency has been due mainly to the fact that the cubic capacity of cars has not been increased in proportion to their tonnage capacity, and that, in consequence, there are many commodities of comparatively little weight in proportion to their bulk which cannot be loaded to the marked capacity of the car. But there is strong, although perhaps not conclusive, evidence that the decrease in the relative loading efficiency has taken place in the handling of commodities which easily can be loaded to the marked capacity of the largest cars. The total capacity of coal cars, including gondolas, increased from 16,432,314 tons in 1902 to 28,468,524 tons in 1907, 73.25 per cent. The total capacity of other cars increased from 25,860,663 tons to 38,564,800 tons, or 49.12 per cent. Meantime, the tonnage of products of mines originated increased from 304,634,808 tons to 476,899,638 tons, or 56.54 per cent., and the tonnage of other products originated increased from 277,197,633 tons to 416,285,334 tons, or 50.17 per cent. In other words, the tonnage of products of mines originated per ton of coal car capacity was 18.53 tons in 1902, and but 16.75 tons in 1907, while the tonnage of other traffic originated per ton of the capacity of other cars was 10.72 tons in 1902 and 10.8 tons in 1907. While figures for tons are not as satisfactory as figures for ton mileage, the former are the only data available, and, anyway, experience shows that the tonnage and ton mileage of coal traffic usually increase in about the same proportion. The figures given show that the increase in tonnage of "other products" kept pace with, and, in fact, slightly exceeded, the increase in the capacity of "other cars," while the increase in coal tonnage did not keep pace with the increase in the capacity of coal cars, which forces us to the conclusion that the decline in loading efficiency was confined to the latter class of cars.

Such data as the foregoing does not necessarily prove that the railways have not profited by the increase in the capacity of their cars and the power of their engines Engines and cars must be built. Their maximum capacity may often be used, and the use of the additional units of capacity when they are needed and available may, and no doubt does, more than pay for the increase in the initial cost of equipment that they cause, and the increased dead weight which they make it necessary to haul. But, on the other hand, the figures seem clearly to indicate that the railways have not benefited by the increased power and capacity of their equipment to the extent that it is desirable they should in their own interest and in that of the public, whose welfare is promoted by every reasonable reduction in the economic cost of transportation. In order that the maximum practicable benefit may be derived by both the railways and the public, it is essential that the average movement, and the average load, of cars and trains shall be increased, and that the amount of empty mileage shall be reduced. The more powerful an engine is, or the more capacious a car, the greater is the economic waste involved in having it run with a light load or stand idle on the side track.

The railways cannot secure these desirable results without the co-operation of shippers and railway regulating authorities. The shippers opposed advances in freight rates on the ground that the railways should secure such increases in net earnings as they require by increasing the efficiency of their operations. The Interstate Commerce Commission in its decisions in the rate advance cases practically endorsed this view. The shippers and the commission, therefore, can hardly consistently refuse to co-operate with the railways in making the increases in minimum carload weights, the modifications in demurrage rules and the other changes which seem essential to enable the roads to get the maximum reasonable results from the use of their equipment.

DELAWARE & HUDSON.

THE Delaware & Hudson is one of the two most important anthracite coal carrying roads whose main source of traffic is coal. It is a short road, operating but 843 miles of railway, but it is a company with a long history. The annual report for the calendar year ended December 31, 1910, is the eighty-first report of the Delaware & Hudson Company. The D. & H. Company both operates a railway and owns extensive coal mines. After the commodities clause was upheld by the supreme court and interpreted in such a way as to permit stock ownership by a railway company in a coal sales company, which shipped coal over the railway, the D. & H., which had hitherto transported its own coal and acted as a selling company, began on June 1 to sell the coal from its mines at the pit's mouth.

In 1910 the railway department earned $20,400,000 gross, an increase of $900,000 over the gross of 1909. Operating expenses, excluding taxes, last year amounted to $12,200,000 as against $11,400,000 the year before. Net operating revenue, therefore, in 1910 was $8,200,000, and in 1909, $8,100,000.

The coal department last year produced 6,647,659 tons of coal, and produced and purchased in 1909, 6,238,653 tons. Last year the revenue from the coal department amounted to $11,800,000, with $11,760,000 expenses, while in 1909 revenue totaled $16,300,000, and expenses $16,100,000. It must be borne in mind that up to June 1, 1909, the coal department revenues and expenses both included the results of the operation of the Delaware & Hudson as a coal selling company as well as a coal producing company. During the whole of 1910 the D. & H. sold its coal at the pit's mouth to the Hudson Coal Company, controlled by the D. & H., or to other companies.

The increase in revenues of the railway department are due to a more prosperous year in the anthracite coal trade; 1909 was a bad year in this trade, and in consequence a comparatively small tonnage of coal was shipped over the D. & H. Last year the company earned $8,700,000 from coal freight traffic. This is an increase of $400,000 over the earnings from this traffic in 1909. Merchandise traffic, which furnished $8,100,000 revenue in 1910, showed an increase of $360,000 over 1909.

As was previously mentioned, operating expenses last year amounted to $12,200,000, which is an increase over 1909 of

$740,000; but out of this increase only $245,000 was increased cost of conducting transportation, while $223,000 was an increase in the cost of maintenance of way and structures and $245,000 an increase in the cost of maintenance of equipment. With the increases in wages that have been put in effect during the last year, this comparatively small increase in transportation expenses, taken in connection with the more liberal expenditures for upkeep of the property, makes a rather exceptionally good showing. After the payment of rentals, taxes and interest charges, the company had a net corporate income of $5,300,000 in 1910 as against $5,200,000 in 1909. This is 12.54 per cent. earned on the stock last year as against 12.22 per cent. earned on the stock outstanding in 1909. Nine per cent. dividends were declared from the earnings of last year, which were the same as declared from the earnings of 1909.

Of the total tonnage of freight—18,800,000 tons—carried in 1910, 64.79 per cent. was products of mines; anthracite coal alone furnishing 8,300,000 tons of traffic, and bituminous coal 2,100,000 tons. Manufactures are the next most important source of revenue tonnage, furnishing in 1910, 2,600,000 tons, or 13.89 per cent. of the total tonnage. The tonnage of products of mines was greater in 1910 than in 1909 by 1,000,000 tons, while the tonnage of manufactures was only very slightly more last year than the year before, and the tonnage of lumber, live stock and animal products, products of agriculture and merchandise was all less in 1910 than in 1909.

The total number of tons of revenue freight carried one mile in 1910 was 2,457,000,000, an increase over 1909 of 66,000,000 ton-miles. The revenue freight density was 2,900,000 tons per mile of road. The average haul per ton was 131 miles, which is slightly less than the average haul in 1909. The average amount received for each ton of freight was 88.647 cents, and the average receipt per ton per mile amounted to 6.8 mills. This is more than the average ton-mile rate of 1909 by one-tenth mill.

Train loading last year was considerably better than the year before. The average revenue train load in 1910 was 432.06 tons, an increase of 17.40 tons. There was on an average 18.10 loaded cars to each train and 7.68 empty cars. This is on an average of a little more than one loaded car more in a train in 1910 than in 1909, and a little less than one empty car less in a train last year than the year before.

The balance sheet of December 31 shows cash on hand amounting to $1,782,372, as against $1,850,765 cash on hand at the end of 1909. There was loans payable at the end of 1910 of $4,494,320, this account having been increased during the year by $169,320. Since the close of the fiscal year the company sold $7,000,000 first and refunding mortgage 4 per cent. bonds, and has paid off this entire loans and bills payable. The annual report says that in addition to the payment of this floating debt, the proceeds of the bond sale are to be used to acquire a branch line from Greenwich, N. Y., to Salem Junction, and to pay for expenditures for additions and betterments to the property, the total estimated cost being $2,208,640.

The following table compares the results of operation of the railway department and of the Delaware & Hudson Company for 1910 with the corresponding figures for 1909:

	1910.	1909.
Average mileage operated	843	843
Coal freight traffic revenue	$8,724,581	$8,311,479
Merchandise freight traffic revenue	8,052,705	7,691,617
Passenger revenue	2,910,026	2,834,628
Total operating revenue	20,431,800	19,525,859
Maintenance of way and structures	1,557,913	1,334,546
Maintenance of equipment	2,842,069	2,598,566
Traffic	249,933	227,347
Transportation	7,066,049	6,821,392
Total operating expenses	12,198,287	11,458,480
Taxes	316,739	301,421
Net operating income	7,916,774	7,765,958
Gross corporate income	10,664,875	10,391,999
Net corporate income	5,330,189	5,194,840
Dividends	3,825,180	3,825,090

UNITED STATES STEEL CORPORATION.

THE sales and earnings of all companies of the United States Steel Corporation during the calendar year 1910 amounted to $703,960,000. This compares with total sales of $646,380,000 in 1909. Earnings, that is, the net figure after the payment of operating expenses, ordinary repairs and maintenance, and interest on fixed charges of subsidiary companies, totaled $141,000,000 in 1910 and $131,000,000 in 1909. In both years the earnings were about 20 per cent. of the gross business. Last year $22,140,000 was subtracted from earnings for depreciation and extraordinary replacement fund, and in 1909 $21,990,000. After the payment of interest on outstanding bonds of the Steel Corporation, and the deduction for replacement, etc., as above, there was a balance of $87,400,000 in 1910; and after the payment of 7 per cent. on the preferred and 5 per cent. on the common there was a surplus net income of $36,770,000. In 1909 but 4 per cent. dividends were paid by the common, and there was a surplus net income of $33,500,000. Last year there was set aside for new plants and construction $15,000,000, as against $10,000,000 the year before, and in addition there was specifically set aside for expenditures at Gary, Ind., $10,000,000, as against $5,000,000 the year before. The balance carried to profit and loss in 1910 was $10,770,000; in 1909, $15,320,000.

As is the case with the railways, the Steel Corporation's wage costs were considerably higher last year than the year before. The entire United States army is about 80,000 men. The average number of employees in the service of the United States Steel Corporation and subsidiaries during 1910 was 218,435, an increase of 11.7 per cent. over the 1909 average. The increase in the amount of the pay rolls in 1910 over the year before was 15.3 per cent. Judge Gary says: "A general increase was made during the year in the salaries and wages of a large portion of the employees of the subsidiary companies, such advances extending to about 83 per cent. of the total number of employees. Advances were made January 16, 1910, in the case of coke companies, and May 1, 1910, in the case of the other companies. The advances averaged, for all employees affected, an increase of 6.23 per cent. . . ."

Beside laying aside more for extraordinary repairs and replacements in 1910 than in 1909, more was spent for ordinary maintenance and repairs last year than the year before. The increase amounted to 20 per cent.

The iron ore mined last year totaled 25,250,000 tons, as against 23,430,000 tons in 1909. The coke manufactured was only slightly more in 1910 than in 1909, totaling last year 13,650,000 tons; while the coal mined amounted to 4,850,000 tons in 1910 and 3,090,000 tons in 1909. The tonnage of rolled and other finished steel products for sale was greater last year by about 1,000,000 tons than the year before, and amounted in 1910 to 10,700,000 tons. It is rather interesting to note that the production of steel car wheels, which is carried on principally by the Schoen Steel Wheel Company, amounted to 98,105 tons in 1910 as compared with 67,985 tons in 1909.

It is quite impossible to make a full analysis of the figures of such a company as the United States Steel Corporation in the space that can be devoted to it in these columns, but certain general lines of development of the company can be traced. For instance, the development of the export business is of very great importance. The aggregate tonnage of rolled steel and other finished products shipped to both domestic and export trade was 10,730,000 tons in 1910, an increase of 10.7 per cent. Of the total in 1910, 1,216,000 was for export. This is an increase of 21.5 per cent. over the export shipments of these products in 1909. The company shipped 6,680,000 barrels of cement in 1910, an increase of 17.4 per cent. over the cement shipments of 1909. The cement plant at Buffington, Ind., has been extended during the year and work on this plant will be completed some time during the summer of 1911. Originally the addition was to have produced 2,000,000 barrels of cement annually, but later it was decided to double the size of the extension and increase

the capacity to 4,000,000 barrels annually. When this extension is finished, the plant of the Universal Portland Cement Company will have a capacity of 40,000 barrels per working day, or a total of 12,000,000 annually.

Another development of the Steel Corporation that has been described and commented on quite fully at different times in these columns is the development of the Gary plant on Lake Michigan. The total expenditure for land development and construction work at Gary up to December 31, 1910, was $69,980,000. The output of the plant in 1910 was 729,072 tons of pig iron; 1,006,252 tons of open hearth ingots; 435,142 tons of open hearth rails, and 340,993 tons of shapes, merchant bars and miscellaneous steel products. To take care of the needs of the subsidiary companies in the Chicago district, a number of coal properties in Illinois and Indiana have been acquired. By the end of 1910 55,624 acres of coal rights and 742 acres of surface had been bought by the Steel Corporation, and the subsidiary company already owned 3,742 acres of coal; so that the total coal territory owned in the Illinois and Indiana fields amounts to 59,366 acres.

The voluntary accident relief plan, by which employees have the privilege of receiving a fixed percentage of their wages when injured, and also the old-age pension plan, have been previously described in these columns. Judge Gary says in regard to the accident relief plan that it has been well received by the employees, and it is considered entirely successful. During the year employees were given the chance to subscribe to preferred stock at 114, and common stock at 70. Subscriptions were received from 26,363 employees for an aggregate of 19,229 shares ($1,922,900 par value) of preferred, and 29,119 shares ($2,911,900 par value) of common.

The balance sheet of the company shows $56,950,000 cash on hand or subject to check, while total current liabilities amounted to $52,830,000. Inventories under current assets are valued at $176,500,000.

NEW BOOKS.

The How and Why of Freight Rates. A defense of American rate-making on value of service plan. By F. H. Plaisted, assistant general freight agent, Oregon Short Line, Salt Lake City, Utah; *The Desert News.* Second edition. 1,000 copies, $51; 5,000, $160.40; 50,000, $1,343.

Mr. Plaisted has had years of experience as a railway traffic officer. He has studied railway economics until he has become a master of the theory of railway freight rates as well as of the practice of making them. He also has a gift for writing clearly and interestingly. Possessing this combination of experience and ability, he has produced in The How and Why of Freight Rates a book which may without exaggeration be called the "Coin's Financial School" of the discussion of railway freight rate matters. The book consists chiefly of an imaginary colloquy between Mr. Shipper and Mr. Railroader, in which Mr. Shipper asks questions and Mr. Railroader answers them. This second edition contains a supplement consisting of some interesting correspondence between Mr. Shipper and Mr. Railroader. Mr. Railroader succeeds completely in vindicating the value of service method of making rates. No pamphlet better adapted to general circulation for the purpose of educating public sentiment regarding railway rates has been written.

Letters to the Editor.

PRESIDENT DELANO ON THE RAILWAY LABOR SITUATION.

Chicago, March 29, 1911.

To the Editor of the Railway Age Gazette:

The controversies and arbitrations about wages and conditions of employment that the railways of the United States have been going through recently afford some exceedingly interesting food for thought. They demonstrate to my mind that some different method of dealing with the question of the conditions of employment and wages of employees of public service corporations must be adopted.

The officials of the labor organizations are, as a whole, pretty able men, and men who realize to a considerable extent their moral responsibility; still they also realize that they cannot maintain their positions as leaders unless they accept the will of those who are in the position of leadership below them. There is a good deal of similarity in the position of the labor leader and that of the politician. Regardless of his own views, he must be a man of very extraordinary qualities of leadership to resist what is called "public opinion." And public opinion in the labor union, like public opinion of the *proletariat,* is largely a manufactured public opinion. The paid committeemen of the various organizations on the railways, like the walking delegates in the ordinary trade union, are men who hold their positions by convincing their constituents of their own importance.

From the standpoint of the railway executive, the situation is pretty bad. Railway labor organizations have a practical monopoly of the employees of the engine and train service. The railway manager recognizes that he will have scant sympathy from the public and little or no protection in case of a strike. There is no such thing as shutting down the factory and letting things "cool off" a little until the men come to their senses. The charter requirements of the railway, the necessities of the public, railway expenses for maintenance and fixed charges going on whether much business or no business is done, all require an immediate resumption of traffic. Under all the conditions, it seems to me the only thing a railway executive can do is to show firmness and patience. Even though he may realize that he has to yield in the end, there is a great deal to be gained by firm, courteous and patient consideration of every demand. When I say there is a great deal to be gained, I do not mean necessarily in concessions, but in compelling the members of the committees to understand the employers' point of view. Furthermore, firmness and patience will give the public time to get around to seeing that they are vitally interested in these questions. Even if it were possible for railway corporations, as it is in some cases with other employers, to advance wages and to put the resultant added expense upon the consumer, it would certainly be undesirable to do so; for I firmly believe that nothing is more important for American railways than to maintain their rates on as low a basis as the most efficient methods and a fair return for capital invested will permit. But at present the great public, upon whom the burden of increased wages and of strikes and lockouts must largely fall, takes only a small amount of interest and has, as a practical matter, little or no voice in the settlement.

Most enlightened people concede that arbitration is far better than actual hand-to-hand conflict. The whole judicial system of civilized nations is built upon this theory; but the arbitration of labor disputes is a comparatively new thing and, as thus far worked out in this country, is unsatisfactory both to the employer and to the employee. I think this is due largely to the prevailing method employed. Instead of arbitration of disputes by a standing court which, by reason of experience and special training, is well fitted to settle such matters, in labor disputes the arbitrating body is selected on the spur of the moment when feeling is running high, with one man representing and advocating one side of the controversy; with another man representing and advocating the other side; and with a third man chosen by the other two representatives, on account of his known or supposed neutrality—or chosen by the court for the same reason—and he is the man who finally has to decide. In the nature of things, these arbitrations have proved to be compromises which rarely go deeply into the matter of the principle involved. Unlike decisions of a court, they furnish no useful precedent for future action, and are of practically no educational value.

As a matter of fact, the decision of these questions involves a great deal of special study. The man or men who should decide them should be largely freed from other responsibilities and

chosen for a reasonably long term. A single able man, as has been demonstrated in the experience of Canada, giving his whole time and thought to the adjustment of controversies between employers and employed, can do an immense amount of good; and where a law exists, such as the Lemieux act of Canada, which provides for mediation and uses the authority of the government to compel both sides to a dispute to desist from open hostilities until the matter has been fully ventilated and carefully investigated, it is an excellent thing. The element of time is in itself of great importance.

My opinion is that in the forming of a court there is a great deal to be said in favor of having an even-numbered court. It seems to me that the tendency of an odd-numbered court is to throw the responsibility entirely on one man; and it was this which our forefathers must have had in mind when they made the jury twelve men. An even-numbered jury or court is more likely to consider the matter in an entirely judicial way than an odd-numbered body—or, at least, so it seems to me—and the fact that a decision carries with it a majority of two is better than having a decision by only one majority.

Of course, in labor disputes that would mean that in some cases there would be a deadlock and no decision arrived at, and in this event the *status quo ante* would have to be maintained. But isn't this a protection to which the public is entitled? A fine example of an arbitration by an even-numbered board is the Alaskan boundary dispute which was decided by a court of six men and a decision rendered four to two in favor of most of the American contentions.

I feel the greatest sympathy and have the greatest consideration for the laboring man. I do not find fault with him for having his labor unions or for trying to get all he can. At the same time there must not be any foolish sentimentality in considering these problems. It is not to be expected that the laboring man, rank-and-file, is any less selfish than men in other walks of life; and even if this were so, it seems very clear to me that the position of the labor leader or the paid committee man compels him to adopt a purely selfish attitude. He is chosen for his position as a paid advocate of favorable labor legislation, increased pay, better working conditions, and reduced hours of labor; and his ability to retain this position depends wholly on his success in accomplishing these things.

Can the public leave this immense force entirely without an acknowledged responsibility to the public, especially considering the fact that public opinion has, little by little, taken away from the employers the weapons of defense which they used to have? Take it at the present time in the United States: Every employer of labor connected with public service corporations is compelled to show his exact financial status and is compelled by charter requirements, as well as by state and federal laws, to render certain specified service. How is it with the labor organization? No public statements of their financial conditions or the earnings of their organizations are required. We know in a general way, from hearsay, that some of these organizations have become very powerful and have accumulated large funds. We know that they are able to keep in their exclusive employ able leaders, good counsel, and a great multitude of paid committeemen. It is very evident that they have great power and very little real responsibility to the community at large, and while, in all fairness, it must be admitted that the time was when the conditions were reversed and the employer exercised an excessive authority with too little responsibility, a medial position between these extremes must now be sought. We have seen the pendulum swing from the extreme of one side to the extreme of the opposite position; but the time is not far distant when the public will recognize the importance of having a voice in settling these great labor disputes, because it is the public, after all, who must pay the bill, either in the form of higher rates and higher prices, or by submitting to a poorer quality of service.

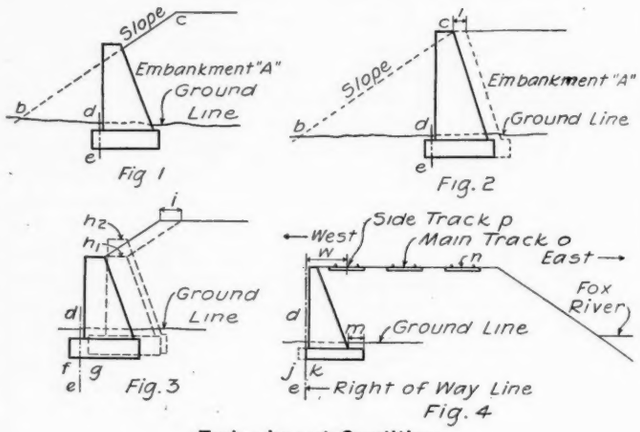
FREDERIC A. DELANO,
President, Wabash Railroad.

RETAINING WALL FOR THE MILWAUKEE AT ELGIN.

BY J. H. PRIOR,
Assistant Engineer, C. M. & St. P.

The Chicago, Milwaukee & St. Paul has just completed, at Elgin, Ill., the construction of a long retaining wall of somewhat unusual design. This wall was designed and constructed under the direction of C. F. Loweth, chief engineer, and the circumstances which led to the selection of this particular type are described below:

A retaining wall can be usually described as a structure such as is shown in Fig. 1 and Fig. 2, which prevents the embankment "A" from spilling forward to whatever point "b" at which the natural slope, "b-c," intersects the ground line. Where it is necessary to build a retaining wall to keep the embankment from encroaching on the ground to the left of the line "d-e," it will also be often necessary to keep the footings from encroaching on the land to the left of the same line, especially in centers of population or industry, where land values are high.



Embankment Conditions.

Where the embankment which the retaining wall restrains is surcharged, as shown in Fig. 1, the location of the toe of the footing of the retaining wall can be moved from the point "f" to the point "g," Fig. 3. The toe of the footing, having been thus moved so as to be entirely on the land of its owner, the designer has the choice of building the wall the height of "h-1," and losing the use of the land of the width "i," or of building the wall to the height of "h-2," and obtaining the use of the land "i," the value of the land represented by the dimension "i" being compared with the additional cost of the retaining wall "h-2" over the retaining wall "h-1," in making a decision.

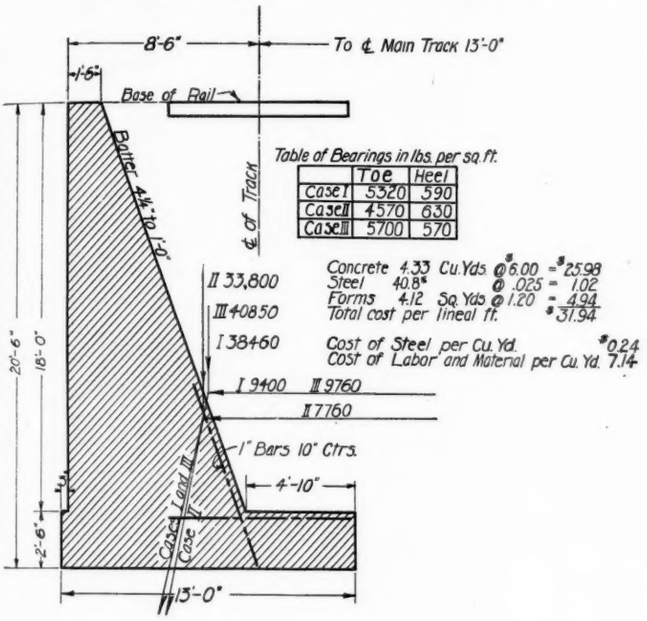
If, however, the top of the embankment is flat, as shown in Fig. 2 and Fig. 4, and it is required that the footings should not project beyond the line "d-e," the full use of the right of way can only be obtained by removing in the design the front projection of the footing, "j-k" in Fig. 4, and by extending the footing beyond the rear of the wall whatever distance "n" is required to give a stable retaining wall of plain concrete, or else by using some special design in reinforced concrete.

The situation represented by Figs. 2 and 4 recurs often enough in railway work to give the matter considerable general importance, especially where the allowable bearing of the toe of the footing upon the foundation is low. The same circumstances which make it necessary to build a retaining wall to keep the railway company's embankment within its own right of way tend to make it also necessary to keep the footings of the retaining wall itself within the railway company's right of way.

Such a situation occurs at Elgin, as shown in Fig. 4; the right of way of the railway company at this point occupies

a narrow strip of the west bank of the Fox river. The ground to the left of the line "d-e" is occupied by a row of mills and factories which abut on the right of way line, and so the footing could not project to the left of that line. The wall could not be moved to the right, as shown in Fig. 2, in order to keep the footings from projecting beyond the right of way line, as it was necessary to maintain the present distance "w" of the sidetrack "p" from the right of way line "d-e," the distance "w" being determined by the use made of the side-track "p." Test pits showed the allowable bearing on foundation to be about two tons. Piles could not be driven, as their driving would interrupt the use of the sidetrack and disturb the foundations of the adjoining buildings.

To meet the above conditions, all the following types, shown



TYPE "A" FIG. 5

Plain Gravity Wall.

in Figs. 5 to 9, inclusive, were designed. The five different types are roughly as follows:

Type "A," Fig. 5, plain gravity wall with footing projecting on the rear of the wall.

Type "B," Fig. 6, reinforced retaining wall, cantilever type.

Type "C," Fig. 7, reinforced wall, buttress type.

Type "D," Fig. 8, cellular retaining wall filled with earth.

Type "E," Fig. 9, a longitudinal wall "t" supported on the outside by buttress "u" with slabs "v" on top, the whole forming a hollow retaining wall.

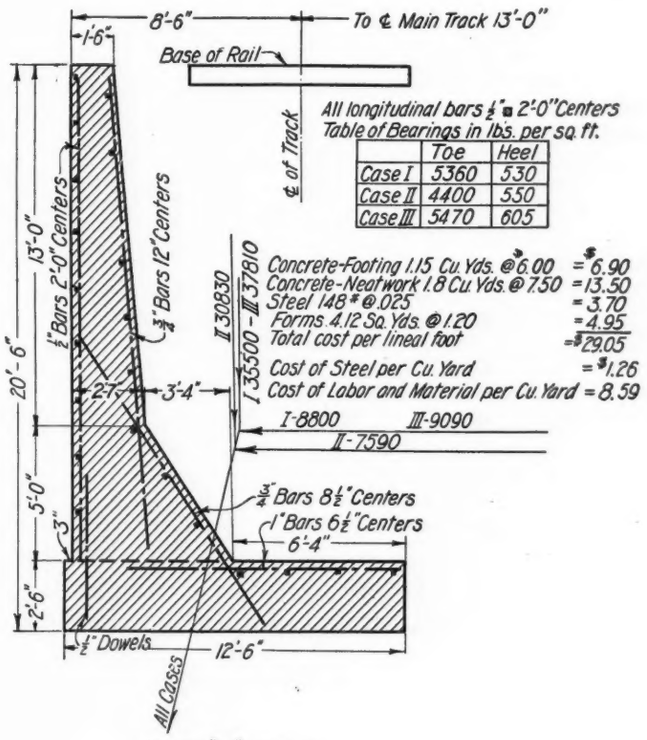
Each of the above walls was investigated for three conditions of loading, namely:

Case I. Live load on sidetrack "P" only.

Case II. Live load on main track "O" only.

Case III. Live load on both tracks.

The type "A," plain concrete retaining wall, requires no explanation. The drawing shows that the differences which are developed between the loading of Case I and Case III are so small for this design that they could have been neglected. The different cases of loading are retained, however, both to show the slight difference which exists between them and to show the same information throughout all designs, instead of omitting information which proved unimportant as the design was worked up. This design has a maximum bearing on the toe of footing of 5,700 lbs. per sq. ft., and its cost per lineal foot of wall is $31.94. Notice that this cost covers only the items tabulated, and does not include such special items as excavation, falsework, etc., since they are subject to such wide variations that it was thought best to omit them in this comparison, as their insertion would introduce a large amount of guesswork. The items shown are those which must be taken account of in

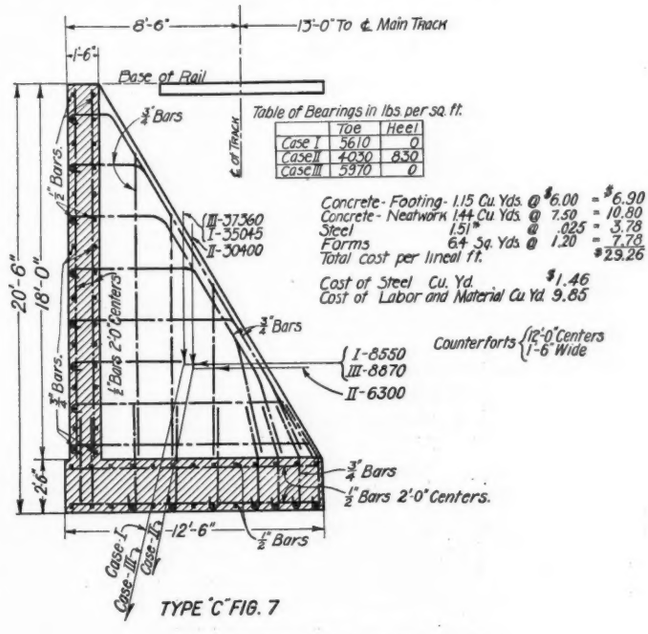


TYPE "B" FIG. 6.

Cantilever Type Reinforced Wall.

every situation, and the reader is left to add whatever special items are required to cover conditions in other places.

The unit prices of concrete per cubic yard, steel per pound in place, forms per square yard, which were selected, were



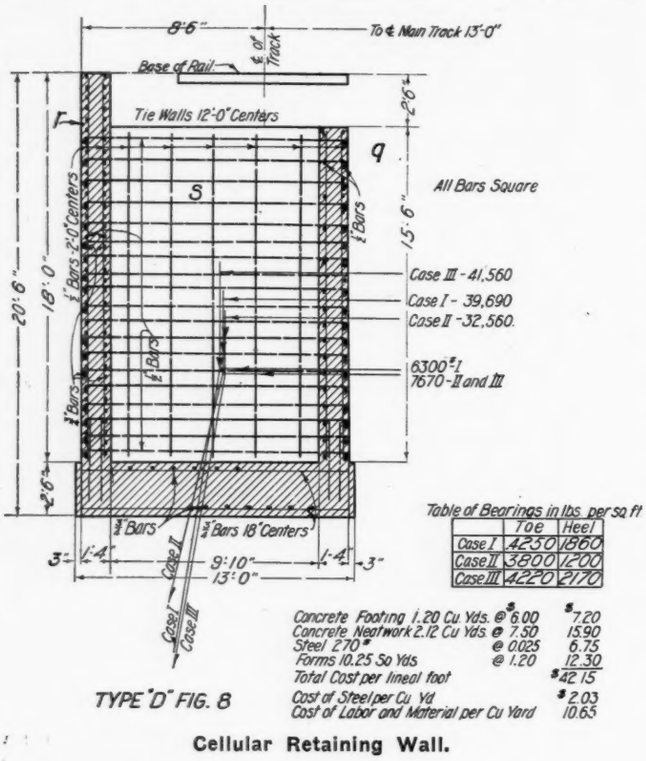
TYPE "C" FIG. 7

Buttress Type Reinforced Wall.

given values which would make them as general as possible. The quantities being given, other unit prices can be substituted by the reader, if he desires. The maximum bearing of

5,700 lbs. on the toe of footing was greater than the foundation would carry, causing the rejection of design "A."

All the essentials of the type "B," cantilever retaining wall, reinforced concrete, are shown in the drawing. This wall has a bearing at toe of footing of 5,470 lbs., and cost $29 per lineal foot; it was found unsuited for the situation for the same reason as type "A:" excessive bearing on toe of footing.


8'6"
To ℄ Main Track 13'0"
Base of Rail
℄ of Track
Tie Walls 12'0" Centers
All Bars Square
Case III - 41,560
Case I - 39,690
Case II - 32,560
6300 # I
7670 - II and III
Table of Bearings in lbs. per sq ft
Toe
Heel
Case I 4230 1860
Case II 3800 1200
Case III 4220 2170
9'10"
13'0"
Concrete Footing 1.20 Cu. Yds. @ $6.00 $7.20
Concrete Neatwork 2.12 Cu Yds. @ 7.50 15.90
Steel 270 # @ 0.025 6.75
Forms 10.25 Sq Yds @ 1.20 12.30
Total Cost per lineal foot $42.15
Cost of Steel per Cu Yd $2.03
Cost of Labor and Material per Cu Yard 10.65

TYPE "D" FIG. 8

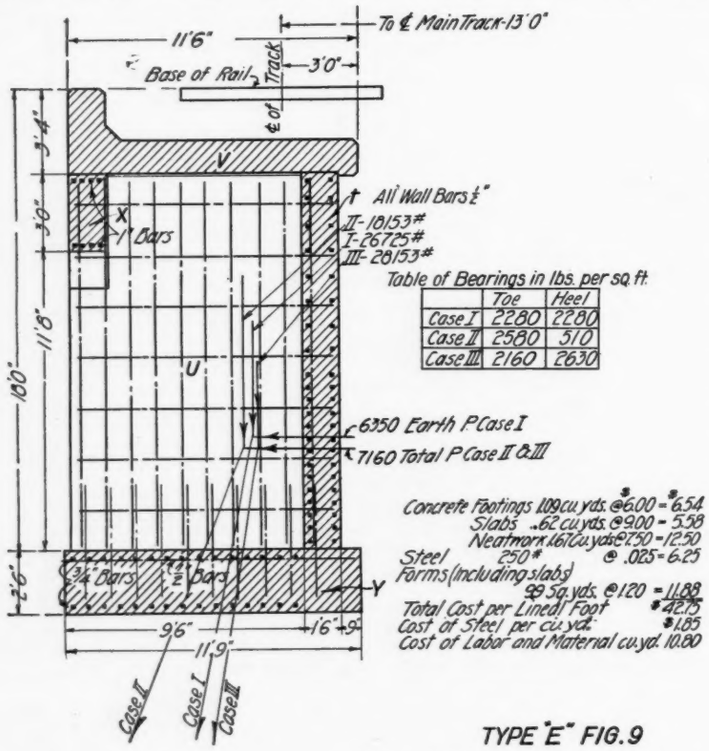
Cellular Retaining Wall.

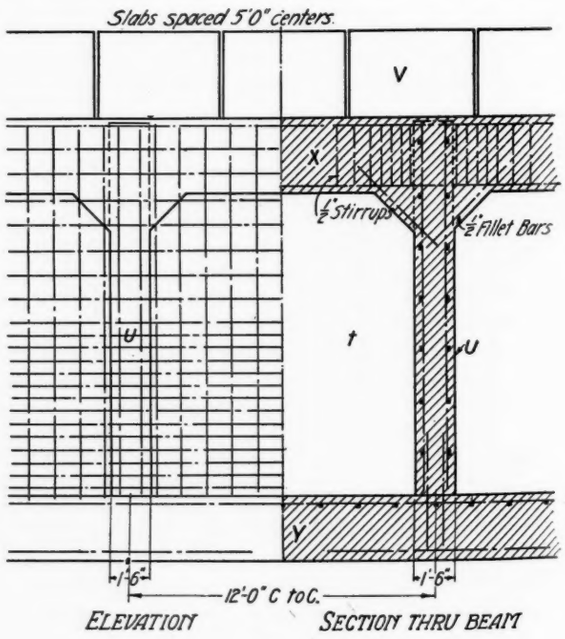
The type "C," buttressed retaining wall, reinforced concrete, is the ordinary buttressed retaining wall. The bearing on toe wall was 5,970 lbs. per sq. ft., and the cost per lineal foot, $29.26. It was rejected for the same reason as the types before.

The type "D," cellular retaining wall filled with earth, is formed of two longitudinal curtain walls "q" and "r," connected by transverse diaphragms "S." The vertical space between the parallel longitudinal walls "q" and "r" and the transverse diaphragms "s" is filled with earth. The maximum pressure on toe of footing for this type is 4,250 lbs. Its cost per lineal foot is $42.15. The design was also rejected on account of high pressure on toe of footing.

The type "E," design of W. S. Lacher, which is a new type in reinforced concrete, as far as the knowledge of the writer goes, is an old type in stone masonry, having been illustrated in Benjamin Baker's Actual Lateral Pressure of Earthwork (see pages 67 and 69, The Actual Lateral Pressure of Earthwork, Benjamin Baker; D. Van Nostrand, New York, 1881) 30 years ago. The wall called type "E" consists of a footing "y," which supports as longitudinal wall "t" and the cross walls "u." The cross walls "u," which are spaced about 12 ft. on centers, connect at one end to the longitudinal wall "t" and at the other end support the girder which spans from one cross wall to another. Above the girder, the slabs "v" are supported at one end by the girder and at the other by the longitudinal wall "t." The drawings show the design in sufficient detail. It will be noticed in this design the maximum pressure on the toe of footing is only 2,580 lbs., which is only 61 per cent. of the next lowest bearing, type "D," and 43 per cent. of the highest bearing, type "C." The cost per lineal foot of this wall is $42.75. As this cost is greater than that of any other type, this design is only suitable to the situations described in the opening paragraphs, namely: where the retaining wall must give full use of the right of way, and have low bearings on the toe of the footing. As this was the situation at Elgin, the design type "E" was adopted and built.

In the retaining wall type "E" the greatest reduction in toe pressure is brought about by eliminating the weight of the earth directly above the footings, the space between the sidewalls "u" being an open and empty space in this design. As the vertical loads on the footings are thus diminished and as the horizontal loads are not much altered, the inclination of the resultant of the vertical and horizontal loads is increased. In


11'6"
To ℄ Main Track 13'0"
Base of Rail
3'0"
℄ of Track
All Wall Bars ½"
II - 18153 #
I - 26725 #
III - 28153 #
Table of Bearings in lbs. per sq ft
Toe
Heel
Case I 2280 2280
Case II 2580 510
Case III 2160 2630
6350 Earth P Case I
7160 Total P Case II & III
Concrete Footings 1.09 cu. yds. @ $6.00 = $6.54
Slabs .62 cu. yds. @ 9.00 = 5.58
Neatwork 1.67 Cu. yds @ 7.50 = 12.50
Steel 250 # @ .025 = 6.25
Forms (including slabs) 29 Sq. yds. @ 1.20 = 11.88
Total Cost per Lineal Foot $42.75
Cost of Steel per cu. yd. $1.85
Cost of Labor and Material cu. yd. 10.80
9'6"
11'9"
16'9"
Case II
Case I
Case III



TYPE "E" FIG. 9

Hollow Retaining Wall; Chicago, Milwaukee & St. Paul.

the resultant, marked Case II, Fig. 9, the ratio of the horizontal to the vertical components is .41, and as this ratio of .41 might exceed the co-efficient of friction of the wall on a slippery foundation, this wall is somewhat unstable if built on such a foundation, and its tendency to slide is the principal weakness in the design. This weakness, of course, is partly remedied by the depth and compactness of the back filling in front of the wall.

In making these comparisons, it was not thought practical to find the cost of the walls of different types having exactly the same toe pressure, but, instead, each type was proportioned in the manner which it was thought would show it in the most favorable way as a whole.

INDIANA RAILWAY LAWS OF 1911.

The law requiring the use of the block system after the first of next January and giving the railway commission extensive powers in this matter has already been noticed in the *Railway Age Gazette*. Following is a list of other railway laws passed:

The caboose law requires eight-wheel cabooses 24 ft. long, exclusive of the platforms, by June 1, 1914, but the commission may grant extensions of time. Cabooses sent to the shops after April 1, 1911, for general repairs must be remodeled to conform to the law. In the case of unusual demands of traffic, the commission may give temporary permission to use cabooses not conforming to the law. The commission is directed to investigate at once the condition of cabooses now in use in the state. The law contains a long list of details of construction.

Senate bill 207 regulates signs at public highway crossings. These signs must bear the word "danger," and where there are two railways, the word "TWO" must appear prominently on the sign.

The "depot law" requires a new building to be put up within six months if an existing building is destroyed, and forbids the use of box cars "for depot purposes" for a longer time than six months; but the commission may extend the time.

House bill 170 requires railway officers to give "character" letters to employees leaving the service, and such employees must be paid their wages within three days after leaving.

Senate bill 44 makes railways responsible for fires set by their locomotives. The railway may procure insurance on property along its line.

Senate bill 275 forbids any railway to permit any section foreman to put his men to work on track outside of yard limits, unless two of the men in his gang are competent flag men.

Senate bill 365 provides for the condemnation of land for the widening of a railway.

Senate bill 251 requiring Interurban lines to maintain suitable waiting rooms, with separate water closets for men and women, is made to apply to all cities having a population of 4,800 or over.

Senate bill 272 allows car trust agreements to run for 15 years instead of 10 years as formerly.

Senate bill 328 requires storm windows on the cabs of locomotives. This law requires the windows to be so equipped and adjusted that the man in the cab can see through them *when open*, under all climatic conditions; but as mention is made also of trouble from rain, snow or ice adhering to the windows it seems likely that what the law really aims to do is to provide a double window, with a hot air connection to melt ice in cold weather.

Senate bill 217 amends slightly the law of 1907 requiring automatic bell ringers.

Senate bill 113 creates the office of locomotive inspector with a salary of $2,000 a year, the inspector to look after defective boilers. This law contains a long list of details. Enginemen and firemen who report defects and do not get them remedied shall then report to the railway commission. This act, like all of the laws mentioned in the foregoing paragraphs, contains a clause imposing penalties, but this one differs from the rest in making the penalty apply to any director, manager or superintendent.

House bill 32 requires mixed trains on certain classes of roads to proceed to the station and discharge passengers before attending to freight, unless the train arrives ahead of schedule. If the company lands the passengers at the station by the time they are due, that is sufficient.

Senate bill 195 modifies the law regulating the running of street cars across steam railway tracks. The conductor, in going ahead to look for a clear road must watch for trains (with no exception) and look not simply for trains which are in sight. This crossing law does not apply to tracks leading to industries, etc., provided these tracks have gates or other protection approved by the railway commission. A section of the law forbids making false reports that no car is approaching. Section 670 makes this law apply to enginemen, conductors and brakemen of trains on steam railways.

Senate bill 385 amends the safety appliance laws. Seventy-five per cent. of the cars in every train on a steam road, and 50 per cent. in the trains on interurban lines must have "approved" hand-brakes in addition to the power brakes already required. The hand-brakes must be kept at all times of sufficient capacity to control the speed of the train.

House bill 6 requires four trains to be stopped each way daily at county seats of 10,000 or more population, except where there is interurban service which accommodates the public. This bill was passed for the specific purpose of compelling the Wabash to stop its afternoon trains at Williamsport for passengers.

House bill 359 amends the law requiring the use of switch lights by requiring such lights to be maintained close to every main track derail.

Senate bill 70 requires a full crew on switching engines on all lines having 25 miles or more of track. The foreman must have two helpers, and he and one of the helpers must have had at least one year's experience as conductor or brakeman.

Senate bill 209 authorizes a railway with a terminus near the state line to acquire stock in a terminal company organized in the adjacent state.

Senate bill 299 regulates the arrangement of electric light and other wire lines which may be strung across a railway.

Senate bill 208 amends the railway commission act so as to require accidents to be reported to the commission by telegraph or telephone. Heretofore, these reports were accepted at any time within five days after the accident.

Senate bill 213 amends three sections of the railway law passed in 1907, and enlarges the authority of the commission to secure evidence.

House bill 279 enlarges the power of the commission to correct unjust transportation rates, and the law limiting to two years the time during which an order of the commission shall be in force is cut out. Heretofore the commission has only had power to recommend new rates and to proceed in the court to enforce them; the new law seems to be designed to give the commission powers similar to those exercised by the Interstate Commerce Commission.

House bill 292 empowers the commission to suspend new rates 30 days, and, if necessary for investigation, 60 days; and the law puts on the carrier the burden of proving that an increased rate will be just.

Two employer's liability bills are drawn in drastic terms, and the Indiana Manufacturers' Bureau is preparing a criticism of them, which will be published.

The Japanese government proposes the construction of various narrow-gage railways in rural districts with an aggregate length of approximately 150 miles. The consent of the Japanese parliament for the construction of these railways has already been given, so the work will probably be taken in hand without delay.

SOUTHERN PACIFIC THROUGH-TRAIN CHART.

The chart shown on the opposite page is a facsimile, reduced about one-half, of one prepared by G. F. Richardson, superintendent of transportation of the Southern Pacific, at San Francisco, for the convenience of those officers of the road who have occasion to make frequent reference to the schedules and connections of the principal through trains. The chart has no scale and is only approximately correct geographically; but, as will be readily understood by any one who has memorized a general idea of the location of the different Southern Pacific lines, this is not a fault. To sit in San Francisco and keep a good mental grasp on this one feature of the Southern Pacific's business one would find it necessary, no doubt, to distort his geography quite materially. Only thus can the image in the mind's eye be brought within the ordinary man's—or any man's—capacity.

TRAIN ACCIDENTS IN FEBRUARY.*

Following is a list of the most notable train accidents that occurred on the railways of the United States in the month of February, 1911. This record is based on accounts published in local daily newspapers, except in the case of accidents of such magnitude that it seems proper to write to the railway manager for details or for confirmation.

Collisions.

Date.	Road.	Place.	Kind of Accident.	Kind of Train.	Kil'd.	Inj'd.
3.	C., C., C. & St. L....	Fern Bank.	xc.	F. & F.	1	2
*7.	Grand Trunk	Gorham, N. H.	rc.	F. & F.	1	0
8.	Southern	McDonald.	rc.	P. & F.	0	10
17.	C., C., C. & St. L....	Springf'd, Ohio.	xc.	P. & F.	0	0
27.	N. Y., N. H. & H...	Putnam.	xc.	P. & F.	0	3

Derailments.

Date.	Road.	Place.	Cause of derailmt.	Kind of Train.	Kil'd.	Inj'd.
†4.	Boston & M.....	E. Jaffrey.	unx.	P.	1	3
5,	St. Louis & S. F.....	Nettleton, Miss.	unx.	P.	0	3
8.	Southern	Chattanooga.	unx.	P.	0	3
13.	Southern Pac.....	Martinez.	d. track.	P.	0	5
16.	Atlantic C. L.....	Clopton, Va.	ms.	P.	0	2
18.	Phila. & R'd'g.....	Lofty.	malice.	P.	1	0
20.	Balt. & Ohio.....	Randolph.	boiler.	F.	3	3
20.	Southern Pac.....	Palisade.	b. rail.	P.	..	20
20.	Kanawha & M.....	Charleston.	unx.	P.	0	12
†20.	Atchison, T. & S. F..	Stillwater.	d. track.	P.	3	10
22.	Atchison, T. & S. F..	Garcia, N. M.	unx.	P.	0	15
26.	El Paso & S. W.....	Pastura.	unx.	P.	0	4
†27.	Chi., R. I. & P.....	Jennings. Kan.	unx.	P.	1	..

The derailment at Lofty, Pa., on the 18th occurred at a switch which had been blocked with a piece of iron so that the wheels of the engine could not pass over it safely. The engine was overturned and fell down a bank and the engineman was killed. In the derailment at Palisade, Nev., on the 20th the engine and first two cars passed over the broken rail in safety, but all of the coaches but one were thrown off the track, and three of them fell down a bank 30 ft. high. It was reported that the injuries of several of the 20 passengers who went down in these cars would prove fatal.

At Smithville, Texas, on the 8th, there was a boiler explosion (not a train accident), in which, according to reports, 10 employees of the Missouri, Kansas & Texas were killed and 7 others injured. The boiler was that of a locomotive which had just come out of the repair shop. The roundhouse was badly damaged.

In a butting collision between a passenger train and a freight engine on the Grand Trunk near Paris, Ont., on the 4th, five persons were killed and one seriously injured. Both engines were demolished and the wreck, which quickly took fire, was mostly burnt up. An express messenger pinned under the wreckage and badly injured, finding that he could not be rescued from the flames, is said to have killed himself with a pistol. The cause of this collision was the forgetfulness of the engineman of the freight train. At the coroner's inquest he said that the annoyances attendant upon difficulties with his engine, which was a new one, had so absorbed his mind that he forgot the schedule of the passenger train.

Of the nine electric car accidents reported as having occurred in the United States in the month of February, one, a derailment at an open draw-bridge at Sheboygan, Wis., resulted in the death of five persons, three of whom were drowned.

* Abbreviations and marks used in Accident List:
rc, Rear collision——bc, Butting collision——xc, Other collisions——b, Broken——d, Defective——unf, Unforeseen obstruction——unx, Unexplained——derail, Open derailing switch——ms, Misplaced switch——acc. obst., Accidental obstruction——malice, Malicious obstruction of track, etc. ——boiler, Explosion of locomotive on road——fire, Cars burned while running——P. or Pass., Passenger train——F. or Ft., Freight train (including empty engines, work trains, etc.)——Asterisk, Wreck wholly or partly destroyed by fire——Dagger, One or more passengers killed.

ROCK ISLAND PREMIUMS FOR EFFICIENCY OF ROADMASTERS AND SECTION FOREMEN.

Announcement has been made from the second vice-president's office of the Rock Island Lines that beginning with the calendar year premiums will be awarded to roadmasters and section foremen on certain main line districts and sections in order to stimulate and reward individual effort and efficiency. The roadmaster of the sub-division on a division or group of divisions whose sub-division shows the greatest improvement in condition during the year will be given a premium of $100, while a premium of $50 will be given the foreman of the section of each roadmaster's sub-division whose section shows the greatest improvement. The award of premiums will be based upon the improvement in condition of the following points:

1. Line and surface, maximum value of 65 marks.
2. Ditches, drainage and roadbed, maximum value of 15 marks.
3. Frogs, switches and joints, maximum value of 10 marks.
4. Spacing ties, maximum value of 5 marks.
5. Right of way, fences and station grounds, maximum value of 5 marks.

The inspection and award will be made by three committees, one for each general manager's district. These committees will be composed of the engineer of maintenance of way and four superintendents. Two inspections will be made annually, one before the season for track work opens, and the second at its close. In measuring the improvements due regard will be given to the force allowed, the material furnished and the weather conditions obtaining during the period under consideration.

This plan will be put into operation at once on fifteen different groups of sub-divisions, and will be extended to other parts of the system as fast as conditions warrant.

A new route is projected for the Midland Railway, Eng., involving the construction of a line through Bradford which would give a shorter and more convenient route for the traffic on the main line going north. At present the main line runs through Leeds. Parliament has already granted powers to the company to construct a line from Royston Junction to the main line near Bradford, *via* Dewsbury. At Bradford it was to run through a tunnel under the center of the city. The company has now abandoned this scheme, but under the powers conferred by the previous bill it has already built a line to Thorn Hill. It now proposes to connect that line with the Lancashire and Yorkshire system, and to run over that company's line to Oakenshaw, from which place a new line would be built by the Midland company in such a manner that instead of tunneling under Bradford the railway would be carried across the city by a viaduct. The existing station at Bradford would be converted into a two-deck station, the new line, of course, running on the higher level. The company considered that this new route would be much more convenient and shorter for the Scotch traffic than the existing route through Leeds.

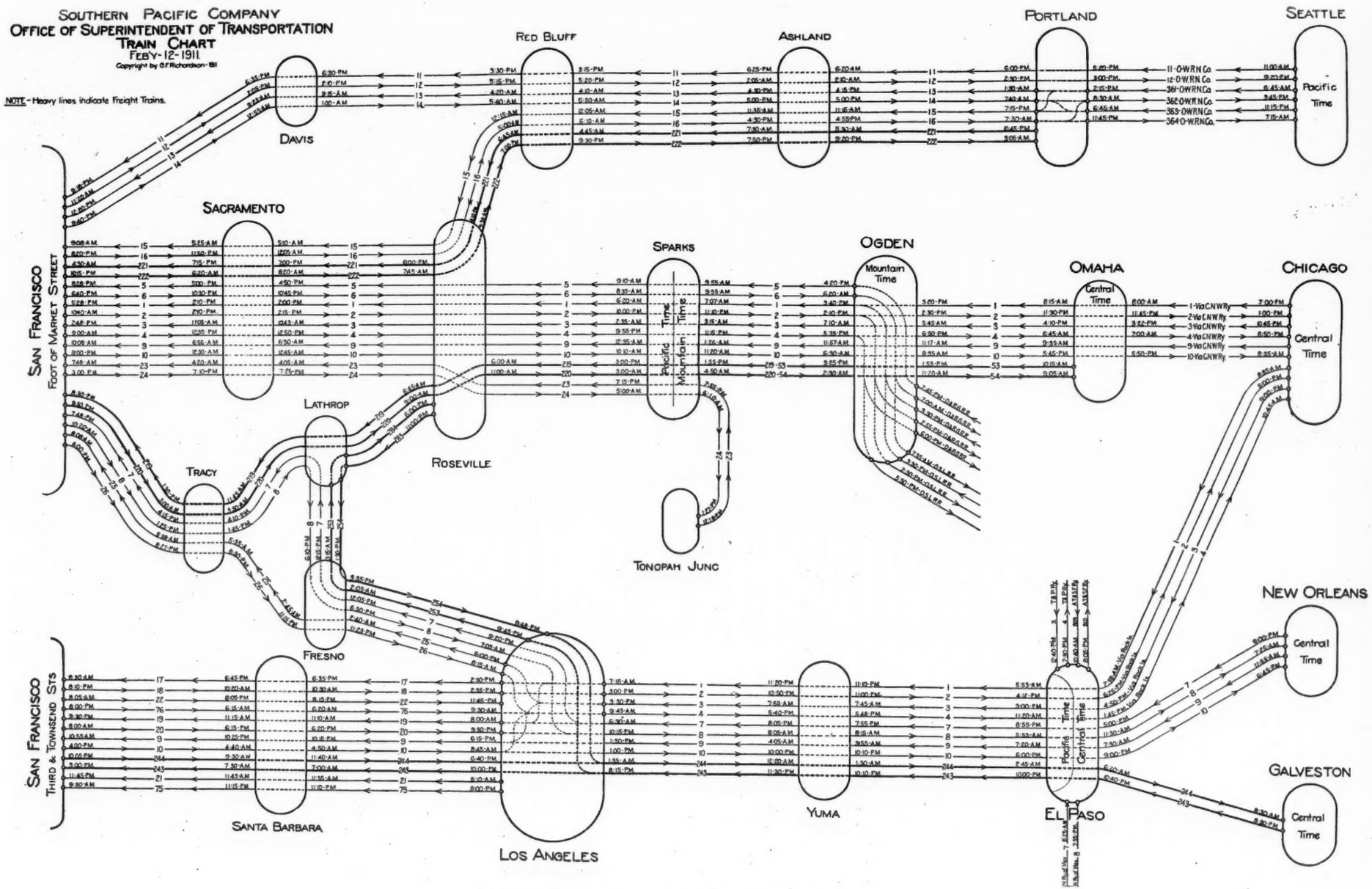


Chart of Through Trains; Southern Pacific Company.

NEW RAILWAY LAWS IN CALIFORNIA.

The 39th legislature of California, recently adjourned, was favored by its members during a session of 85 days with 2,876 bills. Close to 800 passed both houses, and about 225 were signed by the governor; and there were also 105 constitutional amendments presented, 13 being adopted by both houses. These latter go to the people for ratification at a special election to be held Oct. 10 next. Seven bills and six constitutional amendments affect railways, as follows:

Boynton bill; required "full crews" on roads running four or more trains each way each 24 hours. On passenger trains there must be a conductor, an engineer, a brakeman and a baggageman; and if more than four coaches, there must be two brakemen. On freight trains of fifty cars or less the same crew, minus baggageman, and with two brakemen; on more than fifty cars, three brakemen.

Boynton bill; provides that personal injury suits shall be tried in the county in which injury occurred.

Roseberry bill; provides for the creation of an industrial accident board, abolishing the "assumption of risk" and "fellow servant" pleas as grounds for defense; allowing indemnity equal to 65 per cent. of average wages. Employers are given option of liability or of coming under terms of bill.

Kehoe bill; adopts the federal statute in regard to liability of common carriers to employees in personal injury cases. It is identical with the federal law covering liability of interstate carriers. It abolishes the three defenses—assumption of risk, fellow-servant plea and contributory negligence. It is more stringent than the Roseberry employers' liability bill.

Williams bill; provides for the limiting of labor of trainmen and train telegraphers to sixteen hours per day.

Beatty bill; provides that railways shall not discriminate against commercial travelers' sample trunks or catalogs in baggage allowance.

Thompson bill; makes the penalty for wrecking trains life imprisonment instead of death, as heretofore.

Constitutional Amendments

1.—Enlarging the constitutional definition of eminent domain, so that logging railways are included as common carriers.

2.—Giving the state railroad commission control over all public utilities, with power to regulate and establish rates; declaring the right of the legislature to confer powers upon the railroad commission respecting public utilities to be plenary, and to be unlimited by any provision of the constitution. It is provided that the amendment shall not affect such powers of control over any public utility, vested in any city, county or incorporated town as, at the time of the special election, a majority of the electors of any such municipality or county shall vote to retain.

3.—Increasing the number of railroad commissioners from three to five; these to be appointed at large by the governor for terms of six years (instead of elective, as now), the legislature having the power to divide the State into districts for such appointment. The amendment also gives the commission plenary power over all transportation companies.

4.—Commission to have the power to require one railway company to switch to private tracks of shippers upon its own line, the cars of a connecting railway, and to regulate compensation for such service.

5.—Prohibiting advances in rates without permission of commission; prohibiting discrimination and providing that except by commission's permission the charge for a long haul shall not exceed the charge for the aggregate short hauls over the same distance; further that the commission may authorize a lesser charge for a long than for a shorter haul. This power to fix absolute rates is not to be subject to review by the courts, except on a question of confiscation.

6.—The list of persons who may be granted passes is enlarged to include traveling secretaries of Y. M. C. A.'s, and executive officers of mercantile organizations traveling for the advancement of trade or development of industry.

7.—Stockholders of newspapers, wives and children of owners, stockholders or employes, officers of railway men's religious associations, officers of mutual fire insurance companies and agents of season resort hotels may use passes.

All these amendments will be presented to the people at a special election.

COMMISSIONER LANE'S OPINION IN THE RATE CASE.

BY A RAILWAY PRESIDENT.

The opening paragraphs are devoted to showing the assumed duties of the commission and its construction of the "burden of proof" as defined by the law.

The opinion then proceeds to review the position of the carriers and states this to be primarily that "we need the money"; that the effort of the carriers was wholly directed to the effort of securing from the commission a commitment to a "policy which should give the carriers a loose rein."

As to this it may be said that the needs of the carriers for money were, while very real, only incidental to their case, which was mainly that existing rates were too low per se, judged by any known standard of reasonableness.

The opinion says that the government has not undertaken to become the directing mind in railway management, and the commission cannot control expenditures, or direct improvements, or enforce economies. This is a half-truth only. The commission has forced on the railways large expenditures, as well as methods, which in many cases do not commend themselves to railway experts as being necessary, or desirable, or economical, and has constantly reduced their revenues.

The opinion then proceeds to deal specifically with the case made by the Atchison company. It says that President Ripley of the Atchison admitted that operating railways without regulation had not resulted in proper earnings and claimed that under government regulation rates should be put on a paying basis; that the railways had conducted a literary campaign to create the impression that regulation had been injurious, and that it is unreasonable to cry out against regulation and yet ask for benefits which admittedly are not and could not be won in the open field of competition.

Here is another half-truth which tends to create a wholly false impression. Mr. Ripley said that rates were too low. He was not asked *why,* or he would no doubt have stated that it was because of the prohibition of legal and binding agreements between the carriers which is a part of our scheme of legal regulation and which renders it possible for powerful combinations or individuals to work upon the least responsible among the carriers and renders it impossible for the latter to resist. The commission itself is not responsible for this condition, having on various occasions protested against it, yet this absurd application of the Sherman law still prevails and cannot be regarded other than as a part of the plan of regulation which the commission denominates as so beneficent. The "literary campaign" referred to consisted simply of an effort to get the facts in the case before the people—an effort doubtless reprehensible, but made necessary because the statistics published by the commission have been generally incomplete and misleading.

Continuing, the opinion, after saying that the "investment" in American roads is not represented by their capitalization—at the time the carriers were taking action to obtain these advances they were filing annual statements showing that they had never before prospered as a whole as they did in 1910, and quoting from the London *Statist* on the stability of railway securities—refers to the "awkward dilemma" of the American railway man who demands higher rates in order to sustain his credit while his English stockholders demand larger dividends because of increasing profits. To all of this it may be replied that the advances were asked for the present and future and not for the

past; that the railway men saw clearly what was in front of them, which was certain depletion of revenue and that it is small consolation to be told of former prosperity in the face of their belief that it has gone.

Proceeding, the opinion gives various figures showing the past prosperity of certain western roads and the increases in the gross amount of dividends between 1901 and 1910 (without mention, however, of the increase in mileage or investment), and quotes as illustrating the policy that has been pursued, Mr. Ripley's testimony to the effect that he had relined with concrete a tunnel at an expense of $700,000, all of which had been charged to operating expenses in one year. It also states that the Atchison on a "capitalization of $84,000 per mile had earned 4 per cent. on $44,000 per mile of bonds, 5 per cent. on $20,000 of preferred stock and 9 per cent. on $20,000 of common stock." The opinion overstates the Atchison capitalization by about 50 per cent., for which there would seem to be no reasonable excuse, as the commission's own statistics, if properly kept, would refute the statement. As to the relining of the tunnel, it transpired later in the evidence that Mr. Ripley, speaking from memory, had overstated the amount of the charge; also that a portion of its cost had been actually charged to capital account. But it is questionable if such a charge is proper. The tunnel was originally lined with wood, but it proved to be not strong enough and it became necessary to substitute concrete. This added nothing to earnings and probably would not save enough in operating expenses to pay interest on its cost. Why, then, should it not be treated as an operating charge?

The opinion then proceeds to discuss the question of the credit of the roads and seems to find that because large amounts have been borrowed in the past it will be equally easy to borrow in the future. It is a novel theory that the credit of a commercial concern increases with its debt and that the more it has borrowed the more it may borrow. At first blush (if not later, also), the contrary would seem to be the case.

In dealing generally with questions of capital and surplus the opinion says that the six typical western roads increased their surplus from $108,000,000 in 1901 to $242,000,000 in 1910; that there is merit in the argument for the accumulation of a surplus which shall be in a sense a public fund out of which the carrier may draw to create facilities for better service; that rates cannot be increased with each new demand of labor or decreased with each improvement in method, and that society should not take from the wisely managed road the benefits of foresight, skill and organization; that it is doubted if there can be applied a plan of automatically increasing capitalization as rates decrease; that one of the problems of the future is to discover a method whereby the roads may receive adequate return on investment and share with the public the advantages of the surplus; that this cannot be done by the commission undertaking to favor a certain return on the investment and additional return to go into surplus and remain uncapitalized, because the commission has no control over capitalization.

It is mentioned that Mr. Ripley advocated a return of 6 per cent. on stock and a like amount for uncapitalized surplus, but that this dostrine would be quite impracticable because of the divergent methods of capitalization as between stocks and bonds.

Continuing, the commission denies that established carriers should be permitted to amass surpluses so as to bolster their credit and thus be able to extend their lines into territory now insufficiently supplied, and says that this policy tends to create a monopoly of new construction in favor of the stronger lines and that it is doubtful if burdens should be laid on the shipper for that purpose; but that a railway is justified in maintaining a surplus for the meeting of obsolescence and to pay for those facilities which cannot be made to pay any return on the investment; and says this is as broad a definition of legitimate surplus as is required "when we consider that the maintenance accounts of these carriers practically rebuild the roads every ten years." The commission finally sums up by saying that the roads say they need more money, but fail to show that their credit is not good; that they have been unable to secure more money on current rates, or that they cannot make needed extensions or improvements because of lack of faith in their solvency on the part of the investing public.

To all of which it is replied:

That the increased "surplus" of the "six typical western roads" (why typical, and why were only the most successful taken for illustration?) has practically all been put into property mainly for betterment and mainly without adding anything to the capitalization and is in reality a "surplus" only in a book-keeping sense; that while it may be true that "rates cannot be increased with every demand of labor" or "decreased with each improvement in method" the whole history of the commission is one of arbitrarily decreasing rates based on the assumption that the carriers were able to afford it; and that it is a poor rule that does not work both ways.

It is agreed that one of the problems of the future is how the roads may receive adequate returns on investment and share with the general public the advantages of the surplus; that is what the roads want and what we think they have been according.

Mr. Ripley said he thought Atchison ought to be permitted to earn as surplus at least 6 per cent., but he did not lay this down as a rule applicable to all roads, nor did he attempt to announce any "doctrine" on the subject.

Whether it is desirable that surplus should be such as to furnish the older and more stable lines with credit sufficient to enable them to raise money for extensions is perhaps open to argument. Commissioner Lane says such a policy tends to monopoly and that shippers should not be expected to pay for it. Does he realize that these extensions must be built? That if built by independent corporations the public must furnish the money and that those who live along their route must pay for it? Does he also realize that local enterprise must pay higher rates of interest and be content with inferior service; and that such a policy would greatly retard the development of those sections that most need it?

Perhaps the railways "failed to show that their credit was not good," though the price of first mortgage bonds at the time of the hearing and since should be an indication, but the railways were dealing with the future as they saw it; they did not think the outlook for raising the necessary money at reasonable rates was good and they do not think so now. If they are mistaken it will be a source of rejoicing to them and doubtless they will be glad to admit their error in this regard.

The statement contained in the opinion to the effect that the maintenance accounts of the railways "practically rebuilds the railways every ten years" is a remarkable one, and it is difficult to understand what is meant. In any case it has no bearing whatever on the case. The money spent on maintenance is irrevocably gone; it adds nothing to assets except so far as betterments may be included in maintenance, which is not likely to occur to any extent under the book-keeping methods prescribed by the commission.

In the Burlington case the opinion lays down some novel principles, as, for instance, that if a carrier earns a net revenue of $25,000,000 and its stockholders elect to take one-half that sum in dividends and put the other $12,500,000 into the property it may not increase its rates so as to yield return on that investment; that when double tracks or new terminals are needed that fact "cannot justify adding burden on those already receiving service adequate to their needs"; and further, that "investment in additional property must be at the risk of stockholders and not at the risk of the shippers on the old property."

Presumably investment for additional facilities is quite as much in the interest of the present users of the property as of new ones. There are few roads that have facilities "adequate to the needs" of those who now use them. In the case of block signals, for instance, should not the present traveler and shipper

be called on to pay for additional safety and celerity? The Tift case quoted in the opinion is not in point. But accepting the viewpoint of the commission the question still arises, Why does it continually *reduce* rates notwithstanding the flood of advancing expenses and increased investment? In particular, the writer of this opinion has to his credit a long list of opinions justifying reductions, largely on the ground that the carriers are earning too much.

In discussing the value of various railways the opinion quotes the Wisconsin, South Dakota and Minnesota commissions on the value of the Burlington and the St. Paul, and Governor Stubbs of Kansas on the value of the Atchison in Kansas. The Minnesota valuation has been already discredited by the federal courts, and of Stubbs it is only necessary to say that he is in no sense a "practical railway contractor." The estimate so far as regards Atchison is absurd on its face.

The opinion devotes much space to the danger of permitting the carriers to fix their rates on the theory of the "value of the service"; it admits that to have been the theory which has governed heretofore and under which the country has prospered as no other country ever prospered, but it says that to base rates solely on the ability of the shipper to pay is pernicious. Of course, they have never been so based, and the remark that this theory entitled the carrier to examine the books of the shipper is purely gratuitous.

Much credit is taken for the abolition of rebating, which it is stated, formerly absorbed from 3 per cent. to 5 per cent. of the earnings. Without going into details the accuracy of this statement may well be questioned. It is our belief that it would amount to less than half that amount. But the fact that as soon as rebating stopped the larger shippers demanded and received (in most cases) commodity rates quite as low as the net rates they had formerly paid, is wholly ignored.

The opinion deals at length, and most unfairly, with Atchison "cost of service" figures: It says the Atchison average earnings were 10 mills per ton mile and that its "transportation costs" for July, August and September, 1910, were 3.29 mills on the Illinois and Missouri divisions. It is characteristic of the writer of this opinion that out of a mass of figures he selects those that best suit his purpose. In this case he takes the average *earnings* on the entire system, including the far western and desert lines where rates are necessarily high, and compares them with the costs on the divisons of greatest density during the busy months of the busiest year the property has ever known. But this is not the worst of it—in making up these figures he has left out everything except bare transportation costs. In a previous paragraph he says: "cost . . . includes all operating expenses including taxes, not merely the cost of running a train over a track," but he has disregarded his own rule. Had he included all the costs according to his formula he would have stated it as 6.75 mills instead of 3.29. And, similarly, he quotes the six months ending December 31, 1910, as typical notwithstanding the well-known fact that the six months January to June are invariably less favorable. Incidentally, the opinion states that the increase in cost of ties is "almost negligible" it being estimated that it amounts to less than $50 per mile. Assuming these figures to be correct, this "negligible amount" would cost the six typical roads something over $5,000,000 a year.

In fact, the whole opinion is the argument of a man who starts with a preconceived opinion and then seeks justification for it, and so seeking distorts the facts to suit his needs. It is notice to the best of the railways that they will not be permitted to earn much, if anything, more than legal interest rates, and to those less fortunate that they cannot hope for any amelioration of their woes; it tends to kill enterprise and take away all incentive to economy: it is notice to all concerned that if the business increases the rates will be further reduced. And it further demonstrates conclusively what railway men have all along known, viz.: that the Interstate Commission is not fair or judicial or impartial.

CAR ROUTING ON THE NEW HAVEN.

The chart printed herewith was adopted March 1, 1911, by the New York, New Haven & Hartford as a key for station agents in routing carload freight between the New Haven proper and the Boston & Maine. Accompanying it is the following explanation:

In order to obtain proper and uniform routing of all carload freight each freight station on both roads has been given a reference number, which is shown opposite the station name in the alphabetical lists; also a routing chart and a list of routes have been prepared.

Example: If Lenox, Mass., on the New Haven, had a car for East Lexington, Mass., on the Boston & Maine, the alphabetical lists should be referred to and it will be found that Lenox is given reference number 23 and East Lexington reference number 5. Then refer to chart showing the different route numbers, follow line opposite number 23 across to intersection with column 5 and the number 37 will be found which is the route number. Route 37 shown on the list of routes is via Northampton, East Deerfield and Lowell.

Routing of cars from Boston & Maine points to New Haven points will be shown on manifests in reverse order to that given in the list of routes. East Lexington to Lenox, for instance, will route via Lowell, East Deerfield and Northampton.

The full routing must be shown on all manifests which are to be continued through to destination with car.

By the use of 50 index numbers as pointers, the chart shows quickly the carload routings between more than 1,200 stations on the two systems.

CHART SHOWING ROUTE NUMBERS APPLYING BETWEEN STATIONS ON THE BOSTON & MAINE, THE ST. JOHNSBURY & LAKE CHAMPLAIN AND THE NEW YORK, NEW HAVEN & HARTFORD.

N. Y., N. H. & H. R. R. Reference Numbers.	Boston & Maine R. R. Reference Numbers.																									N. Y., N. H. & H. R. R. Reference Numbers.
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	
1	42	49	48	50	47	46	41	12	41	41	41	41	42	45	42	42	46	50	50	46	43	44	43	43	41	44	1
2	3	10	9	11	8	7	2	1	2	2	2	2	3	6	3	3	7	11	11	7	4	5	4	4	1	5	2
3	72	76	75	77	74	73	77	13	13	13	13	78	72	78	71	71	71	77	77	73	73	78	78	71	13	79	3
4	32	39	38	40	37	36	31	30	31	31	31	31	32	35	32	32	36	40	40	36	33	34	33	33	30	34	4
5	52	59	58	60	57	56	53	30	30	53	53	53	30	55	56	56	56	60	54	56	51	54	51	55	51	54	5
6	90	94	93	95	92	91	95	25	25	25	25	96	90	96	89	89	89	95	95	91	91	96	96	89	25	97	6
7	90	94	93	95	92	91	95	25	90	98	96	96	90	96	89	89	89	95	95	91	91	96	96	89	96	97	7
8	90	94	93	95	92	91	95	28	90	98	96	96	90	96	89	89	89	95	95	91	91	96	96	89	96	97	8
9	129	159	158	144	152	152	144	28	116	116	117	117	129	115	101	101	101	139	144	139	115	115	115	115	115	117	9
10	166	166	166	166	166	166	166	26	166	167	168	168	166	166	166	166	166	166	166	166	166	166	166	166	166	168	10
11	130	161	160	145	153	153	145	27	119	119	120	120	130	118	102	102	102	140	145	140	118	118	118	118	118	120	11
12	131	162	162	146	154	154	146	24	122	122	123	123	131	121	103	103	103	141	146	141	121	121	121	121	121	123	12
13	132	165	164	147	155	155	147	29	125	125	126	126	132	124	104	104	104	142	147	142	124	124	124	124	124	126	13
14	130	161	160	145	153	153	145	27	119	119	120	120	130	118	102	102	102	140	145	140	118	118	118	118	118	120	14
15	128	157	156	143	151	151	143	24	113	113	114	114	128	112	100	100	100	138	143	138	112	112	112	112	112	114	15
16	166	166	166	166	166	166	166	26	166	167	168	168	166	166	166	166	166	166	166	166	166	166	166	166	166	168	16
17	133	150	149	134	148	148	134	127	127	136	137	137	127	134	135	135	135	133	134	133	133	133	133	133	133	137	17
18	105	108	107	109	106	105	109	105	105	110	111	111	99	105	99	99	99	99	105	105	105	105	105	105	105	111	18
19	15	22	21	23	20	19	14	13	14	14	14	14	15	18	15	15	19	23	23	19	16	17	16	16	13	17	19
20	81	85	84	86	83	82	86	13	13	13	13	87	81	87	80	80	80	86	86	82	82	87	87	80	13	88	20
21	62	66	65	67	64	63	67	13	68	69	70	70	62	61	61	61	61	67	67	63	63	61	61	61	61	70	21
22	131	163	162	146	154	154	146	13	122	122	123	123	131	121	103	103	103	141	146	141	121	121	121	121	121	123	22
23	32	39	38	40	37	36	31	13	31	31	31	31	32	35	32	32	36	40	40	36	33	34	33	33	30	34	23
24	15	22	21	23	20	19	14	13	14	14	14	14	15	18	15	15	19	23	23	19	16	17	16	16	13	17	24

Shop Section.

C. C. LEECH, foreman of the Pennsylvania Railroad at Buffalo, N. Y., has been awarded the first prize of $35 in the engine house kink competition which closed March 15. Mr. Leech also had the largest collection, but it should be distinctly understood that the judges awarded the prize on what they considered to be the best two kinks in the collection. The second prize of $20 was awarded to H. L. Burrhus, assistant to general foreman, Erie Railroad, Susquehanna, Pa. The other contestants, all of whose collection have been accepted for publication, were Robert G. Bennett, motive power inspector, South Pittsburgh shops, Pennsylvania Railroad, Pittsburgh, Pa.; B. N. Lewis, roundhouse foreman, Minneapolis, St. Paul & Sault Ste. Marie, Enderline, N. Dak.; Thos. Naylor, roundhouse foreman, Chicago, St. Paul, Minneapolis & Omaha, St. James, Minn.; H. S. Rauch, apprentice instructor, New York Central & Hudson River, Oswego, N. Y., and F. Rattek, Brighton, Mass. The major portion of Mr. Leech's collection appears in this number. The others will be published in future issues.

THE competition on the instruction of apprentices and workmen, extended announcements of which were made in the February and March Shop Numbers, will close April 15. The articles should contain from 500 to 1,500 words. A prize of $35 will be given for the best article, and a prize of $20 for the second best. Articles not awarded a prize, but accepted for publication, will be paid for at our regular space rates.

SHOP kinks will be the subject of the competition to close May 15. Shop kinks or handy devices of all kinds used in connection with the maintenance and repair of the rolling stock and equipment in charge of the mechanical department will be eligible for entry. A first prize of $50 and a second prize of $25 will be awarded for the two best collections of three kinks. A greater number of kinks may be submitted, if desired, allowing the judges to base their decision on what they consider the best three kinks in each collection. Kinks accepted for publication, but not awarded a prize, will be paid for at our regular space rates.

RECLAIMING scrap material will be the subject of the competition to close June 15. For the benefit of those who are doing very little or nothing in this matter we want to know of the various methods that are being used in the mechanical departments on other roads. For instance, a second-hand material platform is used at a car repair shop and yard on which material that is found on the scrap platform and is still suitable for service is stored and is reused for freight car repairs. Some of it does not even require straightening after it is taken from the scrap pile; other parts are repaired in a small smith shop at the end of the platform. A description of such a plant and just how it is operated would be of interest. One road scraps all old nuts and bolts; another runs a tap through the old nuts and cuts the battered ends off of long bolts and makes them into shorter standard lengths. Does it pay and how is it done? One road makes all its own bolts from old rods. We want to know the details and as to whether the bolts are satisfactory and if much of a saving is made. It is claimed that the smith shop can utilize a considerable amount of certain classes of scrap to splendid advantage. How, and with what saving? How can the method of oxy-acetylene welding be used to advantage in reclaiming damaged material? Does it really pay to use it for this class of work? One shop is said to carefully sweep up all scrap pieces of lagging from the floor about the locomotive, grind it up, remix it and use it over again. What are the details and what saving results? Is it worth while? There is undoubtedly a point in each case beyond which it is impossible to go without spending more in reclaiming the material than it is worth. How is this point to be determined? What sort of an organization should be formed for developing the proper methods of reclaiming the scrap to advantage? These are only a few suggestions as to subjects which might profitably be considered in preparing an article for this competition. Make it as long or as short as may be necessary to clearly tell your story. The best article will be awarded a prize of $35 and the second best a prize of $20. Other articles that are suitable for publication will be paid for at our regular rates.

SHORTLY after the rate hearing at Washington, at which the efficiency engineers were so much in evidence, the *Railway Age Gazette,* realizing that although the efficiency men had made some pretty serious mistakes, and that, generally speaking, they were not properly equipped to be of much assistance in railway mechanical departments, but also knowing, as all railway men do, that much inefficiency does exist, attempted with the aid of its friends to pick out one of the mechanical officers who gave the greatest promise of effecting a reasonable solution of the problem. That is, who being a good executive with a large amount of practical experience, was of such a temperament and training that he could analyze the claims of the efficiency engineers and, selecting what was good and really worth while, could apply it properly. It did not prove a very difficult problem to find such a man, but it was something of a proposition to get him to go on record. He simply refused to, and for a long time could not be budged. Fortunately for our readers he finally relented and said he would tell us exactly what he thought in the matter if we would not use his name. That explains why the article in this issue on What Is Scientific Management? appears under such an unpronounceable name. It is well worth reading and studying.

REFERENCE is made in the article on What is Scientific Management to certain improvements which have been made in the operation of the machine shops of the Canadian Pacific at Montreal. The time study work, which was the basis of these improvements, was carried on under the direction of H. L. Gantt, who has been known for many years as an engineer who has made an exhaustive study of the science of management and has obtained good results in the application of his theories to certain classes of work. In his book on "Work, Wages and Profits,"* which is a collection of several addresses and lectures which Mr. Gantt has presented at various times before different societies, he tells of the results of his study. Mr. Gantt believes that men suited to any particular kind of labor, if supplied with the proper implements and intelligently directed, can do on the average at least three times as much as the average workman does, if the limiting factor is physical exertion. The ratio would be even greater in work requiring skill and planning. While these results may be possible on such work as shoveling, or in operations where manual dexterity is required and the operations are repeated steadily many times a day, it is extremely doubtful as to it being applicable to any great amount of work in a locomotive or car repair plant. According to Mr. Gantt the following four conditions must be fulfilled to achieve the best results. *First,* complete and exact knowledge of the best way of doing the work, proper appliances and materials. This is obtainable only as the result of a complete scientific investigation of the problem. *Second,* an instructor competent and willing to teach the workman how to make use of this information. *Third,* wages for efficient work high enough

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to make a competent man feel that they are worth striving for. *Fourth,* no increase in wages over day rate unless a certain degree of efficiency is maintained. To get the men to do the desired amount of work and to maintain this output from day to day the manner of performing each job is specified and the workman is paid a bonus for doing it in the standard time. In a shop operated on this system, where each workman has his task, one man, known as the gang boss, usually tends a group of workmen, supplying them with work and appliances and removing the work when finished. He is paid a bonus for each workman who earns a bonus and an extra bonus if all of his men earn their bonuses.

THE EFFICIENCY ENGINEER.

WHILE we have taken great pains to advise our readers frankly of the mistakes that have been made by the efficiency engineers we have taken equal pains to reiterate time and again our belief in the importance of giving more thought to the principles which underly efficient work. The successful man unconsciously follows these principles to a greater or less extent, but ordinarily does not realize the importance of formulating them and using them as a guide, or as a measuring stick of his own efficiency. The recent discussion of so-called scientific management will undoubtedly be the cause of an immense stride in improved efficiency, not because of the advertising it has given the efficiency engineer, for his value as such is questionable, but because it has forcibly directed the attention of thoughful and practical men to a study of the principles which underly efficiency. The danger of this discussion, as we have said before, is that some managers may be deluded into thinking that the efficiency engineer or some of the features commonly connected with scientific management, will be the panacea for all his troubles and will jump from the frying pan into the fire.

When the system craze spread over the country a number of years ago many concerns who rushed into the introduction of it on a large scale, overdid it and not a few of them were forced into bankruptcy. A certain amount of it proved to be a good thing, but the employment of some of the system engineers, who sprang up like mushrooms in a night, proved to be anything but advantageous. It is curious to watch the rapid development in a similar manner of the crop of efficiency engineers—at least they call themselves such—many of whom have had no practical experience in the application of the principles of efficiency and can lay little more claim to the title than that they have read a book or two on the subject.

We smile in a superior sort of way when we read of Ponce de Leon in his search for the fountain of youth and yet we are almost as credulous in these days. The fads and fancies that have been adopted in the average manufacturing shop or on a railway and then dropped like hot cakes bear witness to this. What a scrap heap some of them have made! Let us hope that the principles of scientific management will not be adopted in this way, but that each individual situation will be carefully studied and receive the treatment it deserves. F. W. Taylor, commonly known as the father of scientific management, can be forgiven, if in his enthusiasm he goes beyond all reasonable bounds in his expressions, of the value of his methods and the possible range of their application, for if he had done nothing more than to develop the study of the principles of efficiency, he would have earned a high place in the regard of his fellows. It is unfortunate, indeed, that he has not realized the limitations of some of his methods and that they have not proved more practical, but nevertheless practical men seeing these limitations can modify the methods to suit the special conditions with which they are confronted.

Just as the electrical engineers disagree among themselves as to the best method of electrifying trunk lines—although many good engineers believe it will never be accomplished—so the efficiency engineers each seem to distrust his fellows methods, We are accustomed to class Taylor, Gantt, Emerson, Barth, Morrison and others together, but they do not interpret the doctrine of efficiency at all alike and in many instances they actually contradict each other. Taylor himself has said that: "Scientific management fundamentally consists of certain broad general principles, a certain philosophy, which can be applied in many ways, and a description of what any man or men may believe to be the best mechanism for applying these general principles should in no way be confused with the principles themselves." Let us study the work under our care thoughtfully with the idea of scientifically improving its efficiency, but let us go slow in making any radical change which we may have cause to regret in the future.

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The article on The Mistakes of Efficiency Men in this number suggests that some of them, who have placed themselves in the lime light during the past few months, have been extremely careless in their statements. A railway officer, who is a keen student of men, in speaking of one of these efficiency engineers said recently: "As an expert statistician and a dreamer of lofty ideals he has few, if any, equals. Those who know him best regard him as one possessed of a born gambler's instinct; not necessarily with faro, roulette, or poker, but in taking long chances on making statements that neither he nor anyone else can substantiate, and trusting in Providence that they will be accepted without verification." From the examples cited in the above mentioned article, this statement is at least true of one of them.

Judging from the newspaper reports the leading exponents of scientific management seem to be spending a great part of their time in addressing men's clubs and various other organizations. This is all well enough, but occasionally they find that when it comes to open debate they meet a different type of men from the lawyers they encountered at the rate hearings at Washington. For instance, it is reported that at a dinner of the Boston Economic Club, William J. Cunningham, assistant professor of transportation of the Graduate School of Business Administration of Harvard University, and formerly statistician of the Boston & Maine, dissected "the pretensions of Mr. Brandeis in respect to scientific management saving $365,000,000 a year in railway administration." Frank B. Gilbreth, of New York, followed Prof. Cunningham and took up the cudgels in Mr. Brandeis behalf. We like Mr. Gilbreth, who as a contractor has had such wonderful success in improving the efficiency in the bricklayers' trade, but in his zeal his vision has apparently become somewhat distorted. Repairing cars and locomotives is quite a different proposition from laying bricks. The following report of his talk with Prof. Cunningham is taken from the *Wall Street Journal:*

> Mr. Gilbreth declared: "I don't believe anything Professor Cunningham says. I only wish I had Mr. Brandeis here tonight to refute it. Professor Cunningham never could have made the assertions he does, had he visited the Plymouth Press at Norwood or the Canadian Pacific shops at Montreal. I would like to ask Professor Cunningham if he has ever visited the Canadian Pacific shops at Montreal." And quietly Professor Cunningham responded, "I have." "Have you," said Mr. Gilbreth, "ever visited the Tabor Manufacturing Co. of Philadelphia?" The professor modestly admitted that he had. "How much time did you spend there?" said Mr. Gilbreth, and when the professor quietly responded, "forty-eight hours," Mr. Gilbreth was flabbergasted and proceeded to talk of Frederick W. Taylor of Philadelphia and his stopwatch system. But Brandeis and his "system" rested upon ice where Professor Cunningham had dissected it and laid it out.

Very few people have realized that the Canadian Pacific was doing anything along scientific management lines—that is as the efficiency engineers would like to have us define the term—although by many Mr. Vaughan is considered to be one of the best mechanical department managers on the continent. From the testimony at Washington and the frequent but general references that have been made to it from time to time, as at the above mentioned meeting, one would imagine that so called scientific management reigned supreme at the Angus shops and that wonderful results were being obtained. It is true that the Canadian Pacific did retain Mr. Gantt, but only for about three days a month for a year or less and strictly in an advisory capacity. Some good results have followed—it could hardly be otherwise with Mr. Vaughan at the throttle—but apparently not nearly what the efficiency engineers would like to have us believe.

A considerable amount of time study work has been done, but it has been restricted to the machine shops and it is doubtful whether its use can be extended to other departments to any considerable advantage. Mr. Gantt's system as far it was adopted has been modified as explained in the article in this issue on What Is Scientific Management and a saving has been made *in the machine shops* of not more than 5 per cent. of 25 per cent. of the machine shops pay rolls. This is good, but hardly to be classed with the extravagant claims that have so persistently assailed us for the past few months. It would undoubtedly fade away into nothingness alongside an "assay" of the same shop by that other well-known apostle of efficiency who has specialized in railway work.

STRENGTH OF OXY-ACETYLENE WELDS IN STEEL.

A MOST interesting study of the strength of oxy-acetylene welds in steel* was recently made at the Engineering Experiment Station of the University of Illinois by Herbert L. Whittemore. Mr. Whittemore had had no previous experience in this work and started the investigation by making and testing 50 welds of band iron, 0.135 in. x 1.344 in. In handling the blowpipe and making the welds he followed the directions given in the manufacturer's circular. A series of tests was then made to provide practice in the use of the blowpipe and to determine, if possible, the variables affecting the strength of the welds. The efficiency of the welds, in general, proved to be low. However, certain improvements were developed in the method of making them which are described in the Bulletin as follows:

"Some workmen have found it preferable to work toward the operator rather than away from him, as was done in these welds. In working away from the operator, almost necessarily the blowpipe flame is directed toward the unwelded portion of the plates, making, perhaps, an angle of 60 deg. with the completed weld. The blast from the furnace tends to force melted metal from the end of the weld over upon the colder metal, with which it does not unite, and to make it difficult to build up the filling material to the required thickness. If, instead, the work progresses toward the operator, the blowpipe being held as described above, except that the blowpipe head makes an angle of about 120 deg. with the finished portion of the weld, the flame strikes the sloping surface of the molten metal at the end of the weld more nearly perpendicularly and has less tendency to displace this metal.

"Instead of welding in the bottom of the groove for a short distance, then forming a pool of molten metal of the required depth above it, it seems preferable to add constantly very small portions of the filling wire to the advancing surface of melted metal in the groove. If the work is done toward the operator, this procedure is comparatively easy. The sides and bottom of the groove become melted by the time the weld reaches them and the filling wire can be added uniformly to the comparatively small area of molten metal forming the end of the weld. This area advances, gradually, parallel to itself at all times, which was not the case when pools were formed. To assist in keeping the molten metal in place, the plates may be inclined upward in the direction in which the weld is advancing. A rise of about an inch to the foot is sufficient. Instead of keeping the tip of the flame constantly in contact with the molten metal it is advisable to increase the distance. If removed too far, the metal will not melt rapidly, and satisfactory work is impossible, so that experience shows that it is desirable to bring the flame in contact with the metal when working on cool metal, then gradually to withdraw the flame as long as satisfactory progress is being made."

In the last series of tests the welds were made as described above. In one case the weld was hammered during the blow-pipe operation but this proved to be laborious and, if anything, decreased the strength of the weld. Preheating increased the welding rate and thus lowered the cost, but seemed to have little effect on the strength of the weld. Forging the weld apparently increased the efficiency about 10 per cent. Improper flame regulation effected the efficiency only slightly. The welding rate seemed to be very nearly constant, or 17.5 sq. in. of weld section per hour. The cost of operation increases rapidly with the thickness of the plates; for a ¾-in. plate the cost of gas and labor would probably reach $4.00 per hr., assuming oxygen at about three cents per cu. ft., acetylene at one cent per cu. ft., and labor at 30 cents per hr. Mr. Whittemore concludes that skill in handling the blowpipe may readily be acquired by an ordinary workman; that it is important to have thorough fusion of the material in the weld; that too much emphasis has been laid on the effect of flame regulation, pure oxygen and acetylene, preheating, and hammering the weld on the efficiency of the weld; and that an efficiency of 85 per cent. is as high as can be expected in practice if the weld is the same thickness as the plate.

*Bulletin No. 45, Engineering Experiment Station, Urbana, Ill.

THE LIGHTING OF RAILWAY REPAIR SHOPS.

ONE of the principal advantages of new shop buildings for repairs to railway equipment is the change in construction which provides large spaces in the sides and roof for the admission of light, and on dark days and at night this is supplemented by artificial lighting by improved methods which are not usually found in the old shops. An increase in production under the new conditions has been observed in many instances, and good lighting of shops and factories is now recognized as one of the prime necessities for efficient operation. The construction features of shop lighting have developed rapidly in recent years. and this has materially affected shop architecture. These changes relate to the side and end walls which have a large proportion of glazed sash, and to the roof construction, which tends more and more toward the saw tooth type.

The monitor ventilator or upper deck, which has been used so generally for the lighting and ventilation of railway shops, is an expensive and inefficient construction which still persists, but its existence, except in the case of foundry or smith shop, cannot be justified by satisfactory results either in allowing the escape of gases and hot air, or the admission of light to the proper place. The glazed sash in monitor decks are an extra expense in the first cost of the roof, expensive to maintain, difficult to operate and they increase the roof load and are wholly inefficient for lighting purposes. The direct light from the sky which passes through them only serves to light up some other portion of the roof and scarcely reaches the floor in a diffused form. As a ventilator the monitor deck is not required in summer when the side windows and doors are open, and in winter it is so exposed to high winds that it is more apt to leak cold air into the building than to provide an exit for warm foul air.

During the past year the use of metal sash in new shops and factories has become quite general, and it is also used extensively for roundhouses and railway repair shops. The superior strength of the metal sash makes it possible to use very large window openings, which are unobstructed by the heavy mullions required for wooden sash, and the spaces between the glass panes in the metal sash are so small that a large increase in the amount of light admitted is obtained for a given opening. The strength of the metal sash also makes possible improved forms of saw tooth roofs, where the maximum effect for illumination is obtained and improved methods of operating the sash for ventilation are made possible.

To obtain the benefits of large windows in the sides and ends of shop buildings, it is necessary to locate the buildings with sufficient space between to allow the light from the sky to penetrate the windows in a direct line, and when such space cannot be obtained it is useless to provide large windows in the shop walls, and necessary lighting should be obtained by skylights in the roof. This may be regarded as obvious and elementary, but the simple principle involved is being constantly ignored, and some new railway repair shops, scarcely completed, have large windows in the side or end walls which are so close to other buildings that the direct rays from the sky cannot penetrate them, and they are almost useless except for ventilation in summer.

It is unfortunate that the term "skylight" is usually associated with glass in the roof, and windows in the side walls are not always considered as dependent on the light from the sky for the illumination of the interior, but they are of little use unless they are so exposed. The Luxfer prism for lighting stores and offices on narrow streets causes the direct light from the sky to be refracted at an angle so that it can enter the interior, but plain glass will not do it, and unless this valuable light from the sky passes through plain glass its efficiency for lighting even on

the brightest days is very low. Two-story shops are objectionable because the first floor is dark, and the best way to obtain a well lighted shop with two floors is to make the second one in the form of a gallery with a large skylight over the well. In this way the outside portion of the first floor is lighted from the side windows and the interior portion of the same floor is exposed to the skylight.

It is not sufficient to provide a large area of glazed sash for the side walls and roof, even for day work, for on dull days and in the winter the early morning and late afternoon hours in the best shops are too dark for efficient work and artificial lighting must be the resort. There is often a loss of one or two hours per man per day due to insufficient lighting. The ordinary method is to install arc lamps for general lighting and carbon filament lamps for machine tools and special work benches where fine work is performed, but this is no longer considered a satisfactory arrangement. The development of the metal filament lamps with an efficiency three times that of the carbon filament and with capacity up to 500 candle power per lamp, the vapor lamp, and the flaming arc lamp, have so changed the possibilities for efficient shop lighting that for the same expense, almost the equivalent of bright day light may now be obtained.

The choice and arrangement of these new lamps for railway shops and roundhouses is a matter which should be referred to the illuminating engineer, and most electric companies and lamp makers are satisfied to accept his advice. Under the new conditions ample light should be provided at all parts of the working zone. The illumination should be uniform and the lamps mounted overhead. Individual lamps should seldom be necessary, and the location and size of the larger units should be such as to prevent the glare due to light from an intense source striking the eye. In machine shops with low ceilings, 100-watt metal filament lamps mounted overhead have been found a vast improvement over carbon filament lamps at each machine. For higher ceilings the 250 watt lamp of the same type makes a satisfactory illumination, and very few drop lamps are necessary. For still higher mountings, such as are required by the crane-ways in erecting shops, the arc lamps and the mercury vapor lamps become available, the constant aim being to obtain general illumination from an overhead source.

Having provided a good system of electric lighting, it should be systematically maintained by daily inspection and necessary renewals of filament lamps, the cleaning of reflectors and shades, and repairs. Lamps should be installed with this end in view, so as to be easily accessible for the purpose, although they are often not so placed. The lighting of shops by day or night has a close relation to the quality and quantity of work performed, and the adequate provision made for it under modern conditions will contribute to larger output as well as to brighter and more cheerful surroundings for the workmen.

MECHANICAL ARTICLES DURING MARCH.

The following articles of special interest to mechanical department readers, and to which Shop Number readers may wish to refer, have appeared in the weekly issues of the *Railway Age Gazette* since that of March 3:

Steel Frame Box Car. Detail description of a Canadian Pacific 80,000 lbs. capacity box car with a steel frame throughout. March 10, page 455.

Performance of Pacific Type Locomotive. The Pennsylvania Lines West has thoroughly tried out the Pacific type for heavy passenger traffic and as a result of the performance of one of these engines during the past few years this type will be used for this class of service on the lines both East and West. Details of its performance are given on page 462 of the issue of March 10.

Mallet Articulated Locomotive for the Chicago Great Western. Ten of these locomotives, which are described in the issue of March 17, page 495, will be used between Oelwein, Iowa, and Stockton, Ill.

Heavy Locomotives for the Natal Government Railways. M. Mallet originally intended his design for light railways but we are familiar with the extremely heavy designs used in this country. The Mallets for the Natal Government Railways, which are described in the issue of March 17, page 509, weigh only 196,000 lbs. and are to be used on a 3 ft. 6 in. gage.

The Friction of Freight Trucks. Editorial comment on the American Steel Foundries experiments which show that a truck constructed in such a way that it will remain square while going around a curve will cause much less resistance. March 24, page 675.

Structures at the Northumberland Yard of the Pennsylvania Railroad. The locomotive terminal and car repair facilities at this important yard represent the latest practice of the Pennsylvania Railroad. They are described in a 7-page article in the issue of March 24, page 682.

Electrification of Steam Roads. The electrical engineers are beginning to take a saner and broader view of the electrification problem, realizing that the electrification of steam roads, except under special conditions, will be decided from an economic and financial standpoint and that we still have much to learn about the comparative costs of steam and electrical service under trunk line conditions. An account of the "electrical night" of the New York Railroad Club was published in the issue of March 24, page 689.

Freight Car Truck Experiments. Prof. L. E. Endsley of Purdue University has made extensive experiments at the Granite City, Ill., plant of the American Steel Foundries, which show conclusively that trucks which are built so that they will not get out of square in going around a curve offer much less resistance than those which do. A complete account of these experiments is contained in the issue of March 24, page 691.

Heavy Pacific Type Locomotives for the New York Central Lines. The requirements of through passenger service demand a larger boiler capacity than heretofore furnished on the standard Pacific type locomotive on the New York Central Lines. To obtain this superheaters are being used on the latest order of these locomotives for heavy passenger service. The arrangement of the steam pipes and cylinders and certain details of the Walschaert valve gear have been improved. Sixty Pacific type locomotives have also been built for fast freight service, ten of which are equipped with superheaters. March 31, page 787.

Tests of Pacific Type Superheater Locomotive. During the past year the Lake Shore & Michigan Southern made several series of tests of a Pacific type locomotive with a superheater hauling the Twentieth Century Limited between Toledo, Ohio, and Elkhart, Ind. As a result certain changes have been made including an increase in the boiler pressure and the reduction in the diameter of the cylinders from that originally used. The use of a cross-over pipe between the steam pipes was also found advantageous. March 31, page 790.

NEW BOOKS.

Elements of Machine Work. By Robert H. Smith, Instructor in Machine Work, Massachusetts Institute of Technology, Boston, Mass. Published by the Industrial Education Book Company, Boston, Mass. Cloth; 192 pages, 204 illustrations; 5 in. x 8 in. Price, $2.00.

This volume has been written with the desire of filling a long needed want in the instruction of the student or apprentice who is beginning the study of machine work. It is the first of three volumes on the subject and starts with a few principal definitions which the student must know in order to carry on the work intelligently. It instructs him in the use of the necessary instruments and their application. The elementary work, such as laying out, chipping, filing, scraping, hardening and tempering, pipe fitting, soldering, brazing and elementary millwright work is presented in this volume in considerable detail. The book contains many illustrations showing the method of performing the different operations, which with the complete instructions in the text will enable the most awkward mechanic to obtain fair results.

Principles of Machine Work. By Robert H. Smith, Instructor in Machine Work, Massachusetts Institute of Technology, Boston, Mass. Published by the Industrial Education Book Company, Boston, Mass. Cloth, 388 pages, 434 illustrations; 5 in. x 8 in. Price, $3.00.

This book is the second in a series of three on machine work written with the desire of placing a text book at the service of the student taking up this subject, either in the trade schools or colleges. It is, however, of value to both the student and apprentice. The former will find it more of a necessity, as his study of the work is usually limited to a comparatively short time. The volume contains detailed descriptions of lathes, grinding machines and drills, with the necessary instructions for their operation. It also describes in detail how different work is performed on these machines, the numerous illustrations adding greatly to value of the text. Here, as in the previous volume, the instructions are so complete and minute that the unskilled mechanic may by close application to the book obtain a fair degree of accuracy in his work. An appendix contains tables and other useful data pertaining to the text.

WHAT IS SCIENTIFIC MANAGEMENT?

BY EXYL.

From reading the articles and discussions on scientific shop management in the *Railway Age Gazette,* one cannot avoid forming the impression that a definite claim is made that a large majority of the railway shops are operated in an inefficient manner, a state of affairs that might readily be rectified if the railways would engage the services of a body of men, known as efficiency engineers, and allow them to apply certain systems of scientific management. The question naturally arises, What is this scientific shop management that these engineers employ? Is it a definite system that the efficiency engineers are acquainted with, but unknown to the majority of the railway shop managers; a system that if thoroughly understood might be applied by the latter and result in considerable economies? Or is it simply a case of substituting a man of extraordinary executive and operating ability—the efficiency engineer—for a man of ordinary ability in those lines—the railway shop manager? It can hardly be the latter, for, apart from this reducing the whole proposition to the single claim that the efficiency engineers are men of such superior ability that their substitution for the men at present employed would result in enormous improvements, if there were only enough of them to go around, it would be most unscientific to advocate a system of shop operation that can only be successful under the charge of an extraordinarily able man.

Surely it must be admitted that unless a shop is operated by a system that can be administered by an able, intelligent, painstaking man, such as is to be found in charge of the majority of railway and manufacturing shops, it is in an unstable condition and could not in any way be considered as scientifically managed. In addition, the number of men whose successful operation of railway shops and mechanical departments has led to their selection for important positions in commercial concerns, certainly precludes the possibility of any such invidious comparisons, as it must be admitted that there are plenty of "good fish in the sea." We are therefore forced to conclude that the first supposition is correct, and that the reason for the inefficiency that is claimed to exist in railway shops is not on the whole so much that they are managed by inefficient men as that these men are operating without knowledge of a system or method of shop management, by the use of which millions of dollars could be saved annually. We are then led to our original question, but slightly changed, "What is this system of scientific shop management?" To answer this, one must necessarily turn to the writings and doings of those making the claims as to the improvements that are obtainable.

As Mr. Emerson has taken such a leading part in this work, he can hardly object to being considered as its exponent. Apart from his interesting discussions of the effect of inefficiency upon inefficiency, which closely resembles a demonstration of the fact that 90 per cent. of 90 per cent. is 81 per cent., etc., it would appear, although the statement is, of course, based on the writer's attempted analysis of what this scientific shop management really is, that Mr. Emerson's system really consists of the following methods:

First.—The bonus system.
Second.—The time study system.
Third.—The schedule system.
Fourth.—The work routing system.
Fifth.—Improved shop methods.
Sixth.—A thorough and logical investigation of the possibility of economies in minor matters, such as belts, tools, etc.

Of these it may be considered that 1 is practically original with Mr. Emerson; 2, 3 and 4 are included in the Taylor system of shop management, and 5 and 6 are matters that are constantly in the minds of most shop managers, although, perhaps, not clearly defined by them in a scientific way. However, let us look into these methods a little more closely.

BONUS SYSTEM.

The bonus system is evidently very nearly our old friend, piece-work, with a guaranteed day rate. Suppose a time is set for any job at, say, one hour; then when a workman performs this work in 1½ hours his efficiency is 66 2-3 per cent., and he simply receives his day rate. If he does it in one hour he receives a bonus of 20 per cent.; if he does it in less than one hour he receives an additional bonus of 1 per cent. for each increase of 1 per cent. in his efficiency. In other words, if his efficiency is greater than 100 per cent., he receives a slowly decreasing piecework rate. For instance, if the standard time was five hours, he would receive six hours' pay if the work was done in five hours, and 5½ hours' pay if done in 2½ hours. If this is compared with a man paid by piece-work on the basis of six hours for the same job, we find that the piece worker receives his day rate only, unless he does the work in six hours. He receives the same amount as under the bonus system, or six hours, if he does it in five hours. If he does it in 2½ hours he receives pay for six hours against 5½ hours under the bonus system. Comparing it with piece-work, the bonus system rewards the slow worker more and the fast worker less. *In view of the advocacy, by some of the more advanced of Mr. Taylor's followers, of an increasing piece-work system—one paying more and more per piece as the time is reduced in order to spur the worker to the maximum output—the bonus system cannot be considered as efficient as the piece-work system.*

During the past few years, with increase in wages and improved output, the piece-work system with a guaranteed day rate has possessed some important advantages, as will be recognized by those who have operated under it; advantages not common to straight piece-work or any system based on day rates. It is a well-known system, as is also the ordinary piece-work used in many shops for years past, and they certainly should not be described as less scientific than the bonus system, nor could any material saving be looked for on account of their being superseded by the latter.

The bonus system may be of great value in inducing men to work under a system very similar to piece work, who would be unwilling to do so if it were called by another name, but it does not reward labor as scientifically as does the piece-work system. It does not have the advantage of the premium plan in minimizing the effect of improper prices, as the reduction in pay is too small to be of value if the time is unreasonably reduced. It has the disadvantage, as explained by a committeeman to a manager of one of the large industrial concerns who introduced its use, that "the trouble is when we go home we don't know whether we owe you something or you owe us something." How, then, can this factor of scientific management lead to any hope for economy over the piece-work and guaranteed piece-work systems that have been used so successfully for years in many of our railway shops?

TIME STUDIES.

The time study, which is closely connected with a standardization of work schedules, is without question an important evolution from the older and less definite methods of determining prices and times. Its use in railway shops, even in those which are best operated, is very limited, and there is little doubt that much good will come from the publicity that it has recently enjoyed. Standardization of work schedules is a development that naturally follows the operation of several shops of a railway under any of the various piece-work systems in which costs have been compared for years. The difficulty has usually been that while certain operations are easily compared, others, on account of local differences in the method of handling the work and the class of machines employed, present considerable difficulty. It has frequently been decided that it would not pay to change the method for the purpose of making a comparison, but the possibility of the course has always been recognized. By the use of the time study the relative value of different

methods and the comparative efficiency with which the work is performed may be determined with reasonable accuracy without necessarily disturbing convenient practices. *The standardization of work schedules and the time study are then not supplementary, but the latter largely avoids the necessity for the former, if comparisons are desired.* The former has been used and its extension is a matter of judgment; the latter has been little used in the railway shops and the question is one of the saving that it may accomplish.

The time study is wholly the invention of F. W. Taylor. The reasons leading up to its introduction are described in the masterly paper on shop management read by him before the American Society of Mechanical Engineers in 1903. This paper was more than a mere description or discussion—it was a presentation to the world of the methods used by Mr. Taylor in the analysis of manufacturing operations and the operation of manufacturing plants, and the system that he had devised for insuring work being performed in the quickest time and most efficient manner. These methods were the result of a life's work of a man who practically revolutionized the previous ways of looking at this problem, and are just as far reaching in the line of shop management as the discovery of high speed tool steel has proved in connection with machine work—a discovery that was really only an incident of Mr. Taylor's work. His use of the time study dated from 1883, when he employed it in order to more easily fix new piece rates. It was soon applied to split operations into unit times, from which there came the careful examination of the possible rates at which these elementary operations could be performed.

Herein lies at once the strength and the weakness of the system. Where the total time consists chiefly of machine work or of frequently repeated manual movements, the unit times may be compared with similar operations or known data; where the total time is largely composed of manual movements that vary from time to time, or are not repeated in the same way each time, it may be questionable whether the results obtained justify the complications that are introduced. For instance, in machining different sizes of axles the unit times may be closely compared and the machine times checked up, not only from similar axles, but from data obtained by experiment, or from cutting similar material. This is a case where the total time consists largely of machine work. In the examples of handling pig iron, laying brick and the inspection of balls, given in Mr. Taylor's paper, and in which wonderful results were obtained, the work consisted in manual movements constantly repeated. Now, even in these simple matters the compilation of a time study is a fairly complicated matter, requiring for the operation of loading pig iron no less than six unit times; two were variable depending on the distance the pig was carried, and two were alternate, dependent on whether it was thrown down or placed in a pile. This illustrates another requirement of time study work, namely, the standardization of conditions.

Now, consider the application of this method to many of the jobs in a railway repair shop, such as stripping engines or facing shoe and wedge faces. No doubt the time study system can be applied, but the question is: Would it pay? And before it was really worked out, would it not be necessary to compromise by letting a unit price go through that was not properly corrected for every possible condition, or else get up a system so complicated that an inspector would have to stand over each man to keep a record of the variable conditions he encountered? For instance, the man may be taking down an air pipe clamp. One time the nut comes off in his fingers; another time he tries a wrench, and finally has to chip it off. Of course it can easily be arranged to adjust prices to conditions, but a shop may handle 60 or 70 different classes of engines, some to be stripped down and some to be partially stripped; in one case a bolt falls out, while in another it has to be drilled out; in one case one bolt has to be removed and in another six. Illustrations of this kind could be multiplied indefinitely, but the gist of the matter is that *in a great majority of repair shop operations, the price paid for the job is not based on the time required to do an accurately defined amount of work, but is practically a contract with the workman by which he accepts the variations in the amount of the work to be done in consideration of an average price.* That this is the case on the Santa Fe is clearly shown by an inspection of its schedules, even though a closer account is taken of the variation in the work to be done than in most railway piece-work shops. It may, therefore, be assumed that Mr. Emerson encountered the difficulty that is almost obvious with regard to the application of the time study system to the work on which the manual operations are varied, or in which the standardization of conditions is too complicated, namely, that it was more cumbersome and therefore less efficient than the ordinary method.

By the latter is meant the setting of a price or time by a practical man who judges the proper allowance by timing the job as a whole and determining from general observation a price which will reward the men when they are working intelligently and under average conditions and maintaining what a shop man would call a good gait. This might be called the aggregate system as opposed to the unit system, which is what is meant when time study work is referred to. It must be acknowledged that whether applied to small operations or large ones, it has been the general one in use in determining repair shop times and prices. It is no doubt not as scientific as the time study. *Neither are many short cuts scientific, but if they are sufficiently accurate and avoid the expense entailed by more detailed but complicated systems, nothing can be gained by going to the latter.* There is no doubt, however, that, as previously stated, time study will be far more used in the future and with considerable benefit. It is, however, doubtful whether in the average well-run shop the saving to be obtained from its introduction will be sufficiently large to greatly lower the cost of maintenance.

Scientific Management at the Angus Shops.—If you inquire at the Angus shops of the Canadian Pacific Railway, where considerable time study work has been carried on under the direction of H. L. Gantt, you will find that so far its use has practically been restricted to the machine shops, and that its extension to the remainder of the plant is hardly considered practical for reasons very similar to those outlined above. In addition, it is being used at those shops in a somewhat different way from that usually outlined. *The demonstrator, who in Mr. Gantt's system is the pacemaker for the shop, is used as an educator and devotes his time to getting the machine operators to obtain the desired results and in devising better methods of performing the work.* With this modification, the Canadian Pacific officials are exceedingly pleased with the system which has reduced the costs and increased the men's earnings—a most satisfactory condition. The reduction in cost has not, however, thus far exceeded about 5 per cent. on 25 per cent. of the shop pay roll; so that while the work is going on steadily and energetically, it certainly has not led to any enormous reduction in expenses. Such a thing would hardly have been expected. The shop has been operated under a good piece-work system for years, and while an improved method of studying prices is a distinct step in advance, and its benefits will probably increase as time goes on, yet the system is not going to revolutionize matters. Neither will it do so in the average railway shop, unless other conditions can be introduced. There are many shops whose prices and costs are higher than those in charge would like them to be, and if the time study system were installed and prices reduced, quite a substantial saving would result. If the time study system were not installed and prices were reduced, where this is already known to be possible, there would also be a good saving; not quite so much, perhaps, but fairly close. But the gentlemen who are trying to operate a complicated proposition for the good of the whole road have to balance the cost of fighting the matter out against the results

that would be obtained from a small section of the combination under their control, and understand their conditions sufficiently well to be competent judges. *Let us give the scientific time study lots of credit; it has any amount of good points, but it is not a panacea for all our troubles.*

SCHEDULE AND WORK ORDER SYSTEMS.

The schedule and work order systems are also part of the scientific management scheme. The schedule system is no doubt good where it can be used, and it could no doubt be of considerable advantage on the Santa Fe on account of their using a 15-day schedule for repairing locomotives. At Altoona, where an eight to ten-day schedule is in effect, the usual planning system would be too slow. It would not be much use informing a foreman that he was two or three days late with his work; if he were he would upset the entire shop. The fact is that the schedule system in various forms has been operated in railway shops for years. Probably the first shop to repair engines in a minimum number of days was the Chicago & North Western at Chicago under Robert Quayle. The Altoona shop has, if anything, gone Chicago one better, and the Roanoke shop of the Norfolk & Western is doing practically as well. *It is doubtful if any manufacturing plant in the country does smarter work than that of turning engines out of these shops.* They have been led to it by their conditions, viz., ability to increase their machine shop facilities and difficulty in increasing the size of the erecting shop. Now they regard it as an economical proposition; other railway shop managers do not. An engine costing $15,000 is only worth about $2 a day for interest, and a week more in the shop, costing $14 per engine, is easily lost in the labor and material costs if the work has to be hurried. Evidently this is a case of conditions and judgments.

The whole question of the schedule system is one as to the length to which it is advisable to go. It may vary all the way from the complete planning department advocated by Mr. Taylor, which, however, was advocated by him for plants which were not railway repair shops, down to a single statement of the dates engines are to be turned out. It is a great question whether close scheduling is advisable in the average plant, and it will in general be found that in a shop doing straight repair work, with a minimum number of days allowed in the shop, the schedule is simple. If a variety of repairs, light and heavy, together with a quantity of manufacturing work, is handled, a more thorough scheduling is advisable. There is one principle in this work that must be admitted, namely, that a system should never be carried any further than is found advantageous. *The moment we begin to run a shop for a system instead of a system for the shop we begin to lose money.* Too much scheduling may easily result in making work harder to handle instead of easier, and the work order system has yet to prove its merit under conditions as variable and complicated as those in the ordinary railway shop. Let the system of scheduling work be given full credit as an important adjunct of shop management, but it is absolutely inaccurate to claim that its introduction would be an important reform in the average well-run railway repair shop. It has been used in them in a practical and successful form for years.

LABOR SAVING DEVICES.

If there was one thing more annoying than another to the railway shop man during the recent discussion it has been the inference from the illustrations of the various labor saving devices used on the Santa Fe that the idea of developing appliances of that kind was broadly new. All must admire several of the ingenious machines and methods that have been so freely illustrated not only in the technical journals and pamphlets describing the work accomplished, but in the popular magazines. Many no doubt have enjoyed seeing the product of their inventive efforts given so much publicity, even though their names were not attached. Of course, any shop man knows of the large amount of ingenuity that has been expended in railway shops all over the country, and the shop columns of the *Railway Age Gazette* have brought out a collection of shop kinks which would reflect credit on any branch of manufacturing work. There is any amount of this work to be done, but it has never been a neglected side of railway shop work, and it does appear as though credit has hardly been given where it is due, when we find a man in Mr. Going's* position illustrating in his examples of betterment work on the Santa Fe the machine forging board, the scrap reclaiming machines, the oil spray for trucks, air hoists on tools, knock down truck for engines, car wheel drop pit, a home-made bolt cutter, oil tire heaters, and a few other familiar old stand-bys. Surely if he wished to be of value to the benighted railway men he ought to have picked out a few new ones. *The fact is that most roads have paid pretty good attention to this class of work.*

Sometimes a just criticism might be made that devices have been made up that will never pay for the time and expense devoted to their development. That, however, is almost a necessary evil in any business. The *Railway Age Gazette* should publish its collection of shop devices in a properly edited book form, and then ask any unprejudiced engineer—efficiency or otherwise—if he does not consider that this detail of management has received good attention.

MINOR ECONOMIES.

The investigation of the possibility of economies in minor matters is another thing that will certainly do good by giving it publicity. Railway shops, as a rule, do not have sufficient supervision to take up these less important details as carefully as they should. At the same time these minor economies, while well worth following closely for their own sake, are not able to effect seriously the total cost of maintenance. Mr. Emerson has made a good deal out of the question of belt repairs. Most shops have men especially in charge of this, although not, as a rule, college graduates, as they have usually been considered of more value in other work. After reading Mr. Emerson's statement of the improvement made in this respect, and that the cost of belt maintenance should not exceed 15 per cent., the writer obtained figures as to the cost of maintenance and the value of the belting in a large railway plant, in which both iron working and wood working machinery were used. The annual cost was about 20 per cent. of the total value, so that allowing for the fact that during the year prior to the cost being reduced on the Santa Fe a very large expenditure had been made for belting—and it was presumably pretty nearly all new—the railway shop, with a good belt man in charge, does not show up so badly. One cannot help feeling that Mr. Emerson was very unfortunate—or shall we say fortunate—to strike a road on which conditions in that particular respect were so bad.

There are, of course, numerous other items which deserve closer attention than they receive in many cases. Conditions in this respect are similar in both railway and manufacturing plants. One manager gets after the little things better than another, and yet they may both be good men in many ways. Most shops, however, are careful about small things that cost money. They soon get called down by their superiors if the supply requisitions go up; and while, perhaps, economies may be effected in this as in other lines, they are not great or anything like those claimed. Railway shops are just like other shops in this respect. Some have adopted a standard tool system; others have not. Some are up-to-date; others are behind. But it is reasonably safe to say that *the average efficiency engineer will spend more money than the railway man does in the maintenance of minor items, and that plenty of railway men would spend more if they could.*

CONCLUSIONS.

In conclusion, without explaining that comparatively few shops in the country, whether railway or commercial, have adopted the Taylor system, Mr. Emerson has made the assertion

* In his book on Methods of the Santa Fe, published a couple of years ago by *The Engineering Magazine.*

that by introducing the modified form of it which he advocates, enormous savings might be obtained. The results of his work on the Santa Fe are quoted as an illustration of the economies that are available. Without discussing what saving was actually made there, no one would expect Mr. Emerson with his well-known ability to fail to introduce substantial improvements. There can be little question of his having been of great service to the road. A well-posted up-to-date efficiency engineer would in almost all cases be so in any railway shop. But it certainly is unsafe to make sweeping assertions based on a comparatively short experience on one road. It is well known that maintenance costs cannot be judged on the results of a short period. It has been a common saying that anyone can make a record for a year or two, and on a railway in a normal condition this has been done more than once. The conditions on the Santa Fe must also have been favorable from some of the illustrations in Mr. Going's book, showing Japanese and other men doing work previously handled by machinists. Reductions in cost due to the introduction of cheaper labor can hardly be credited to a system. In many other ways conditions apparently existed which afforded a good opportunity at the time to a capable shop manager.

This is not, however, the question. Efficiency engineers, whoever they may be, cannot stand on the claim of their superior ability. They must effect their economies by the introduction of systems of management by which the present shop forces may obtain improved results, not by a change in the force, unless it is found incapable. They should therefore be able to explain their system, just as F. W. Taylor explained his. Some people believe that the Taylor system of management might introduce great economies in every machine shop in the country, whether railway or commercial. Others consider that under special conditions the system may be applied in its entirety, but that in general practice its application is limited. Mr. Emerson is one of the latter, for in his work on the Santa Fe he has adopted certain features of it and discarded others. Probably Mr. Taylor would consider a shop operated under Mr. Emerson's system inefficient, and with almost as much reason as the latter has for stating that railway shops are inefficient.

We have, however, examined Mr. Emerson's system, and wherein is the reason for the saving claimed? He advocates several methods of shop management that are excellent things in their way. The bonus system, time study and work schedules are all important adjuncts to the general proposition of efficiently running a shop. They are not, however, radically new discoveries, and the fact is that each must be used to the extent that it is advantageous. *To advocate any particular system by which to operate a shop, having such varied problems as a locomotive repair shop, is like advising that all plane surfaces should be finished by milling.* No doubt the introduction of milling machines effected improvement reductions in the time required to do certain classes of work, but the good shop manager is not the man who therefore insists on its universal use. Systems are like machines, they should be used for the purpose they are adapted to, and the best results are going to be obtained not by the Taylor system or the Emerson system, or the Gantt system, but by using what is good and useful in each, combined with good common sense management.

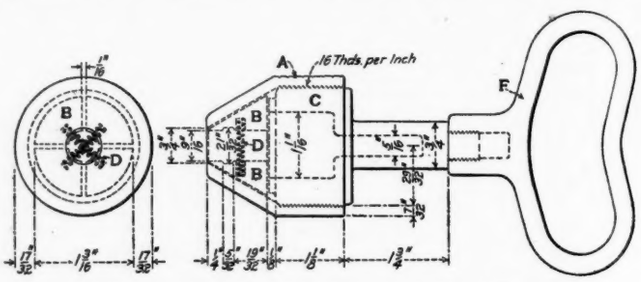
Mr. Emerson must know that there have been efficiently and inefficiently managed railway shops just as much as in other lines of work and that this has been largely a question of the quality of their superintendence, or the restrictions placed on them by the management. They are manufacturing plants run by an institution that is not in the business of running manufacturing plants. In many cases they have not been granted the necessary appropriations to keep their equipment up; they have not been allowed the proper supervision to watch their expenditures; and the management has not, and in some cases does not, realize the requirements of efficient shop operation and sees little difference between the organization required for a large repair shop and that for a section gang. In spite of that, one general foreman after another has been faithfully doing his best to get along with the facilities he had and turn out his work as cheaply as possible; making machines when he could not buy them, and doing many things that were not strictly efficient, but were the most efficient things to do under the circumstances.

Luckily this state of affairs has pretty well passed away, especially on the larger roads. Shops are now recognized as important factors, and their proper equipment and superintendence is given reasonable attention. There may still be some inefficiency, but it is going to be cured by better men and better management, and not by the use of a specific system. Mr. Emerson's idea that the best sort of management is none too good for a railway shop is all right. It is a pity to see a railway man handling a shop with a $75,000 pay roll leave because a commercial concern can pay him double the salary a railway can. If he can induce the men in charge of railways to realize the importance of retaining their able men, he will have done some more good work; but it was unjust and misleading to make claims that reacted on the efficiency of the good shops and poor shops alike, and to prophesy such wonderful results for a new system that is not new, and which many employ in whole or in part.

TRIPLE VALVE PISTON PACKING RING GRINDING TOOL.

BY FRANK J. BORER,
Foreman Air Brake Department, Central Railroad of New Jersey, Elizabethport, N. J.

The grinding of triple valve piston packing rings was formerly done at the Elizabethport shops by a tool made of a piece of ¾-in round steel, a hole being drilled in one end to receive the piston stem and a handle being placed on the other end, similar to the one shown on the accompanying sketch. The piston stem was secured to the tool by a set screw; this arrangement was unsatisfactory because of the set screw slightly damaging the end of the piston stem. We are still grinding most of our triple valve piston packing rings by hand, as it is doubtful if any time can be saved, or better work be done, by the use of a machine unless a number of men are engaged in this class of work and a machine is provided that will grind at least eight triple valves at one time. Experience has taught us that it is much more important to have the triple valve piston cylinder bushing and the triple valve piston packing ring groove put in good condition, so that the triple valve piston packing ring is a perfect fit in the groove and in the cylinder bushing. The grinding of the ring is then a simple operation. If the triple valve cylinder bushing is not in good condition, we roll it with a special triple valve roller and also true up the triple valve piston packing ring groove if it is necessary. The improved tool for grinding the piston packing ring is shown in the illustration. The adjusting nut A contains four jaws B, which are held apart by the coiled springs D. In using the tool, the piston stem is placed between the four jaws, and the adjusting nut A is held in one hand while the stud C is revolved and moved inward by means of the handle F, thus closing the jaws B.



Triple Valve Piston Packing Ring Grinding Tool.

Engine House Kinks.

FIRST PRIZE.

PENNSYLVANIA RAILROAD, BUFFALO.

BY C. C. LEECH,
Foreman, Buffalo, N. Y.

CLAMP FOR EXHAUST NOZZLE WHEN TESTING STEAM PIPES.

A clamp for exhaust nozzles, when the steam pipes are being tested, is shown in Fig. 1. The cap A fits in the top of the nozzle after the tip has been removed. A steam tight joint is secured by placing a rubber gasket over the top of the nozzle. The clamps B are moved inward along the bar C and fit under

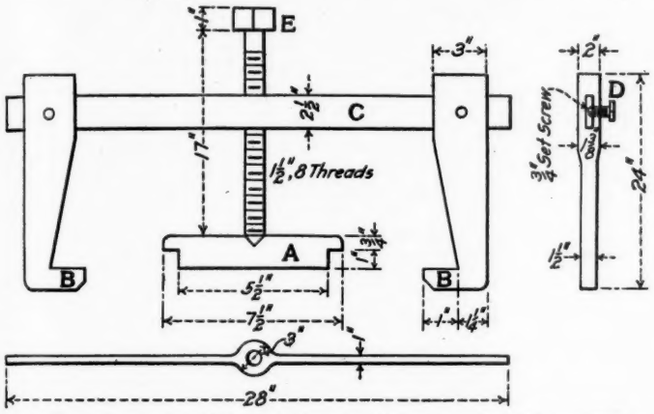


Fig. 1—Clamp for Exhaust Nozzle When Testing Steam Pipes.

the edges of the flange of the nozzle casting. When these have been properly adjusted they are secured by the ¾-in. set screws, and the cap A is forced securely over the top of the nozzle by turning the screw E.

REMOVING ECCENTRIC CRANK ARM OF WALSCHAERT VALVE GEAR.

A device for quickly removing the eccentric crank arms of the Walschaert valve gear is a necessity in the engine house. A

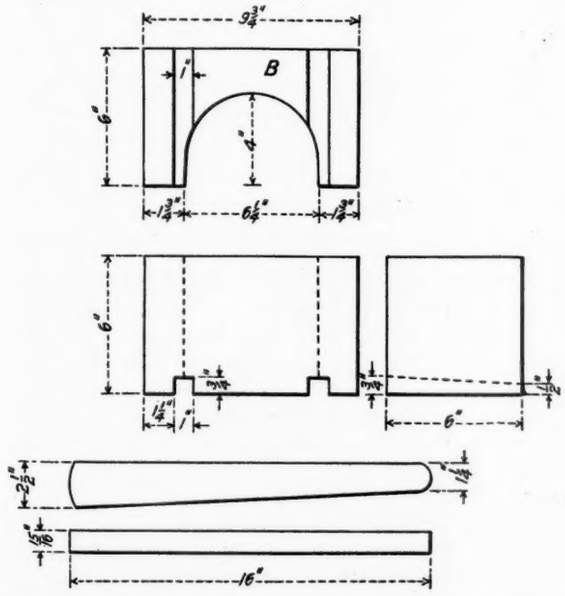


Fig. 2—Block and Wedges for Removing Eccentric Crank Arm of Walschaert Valve Gear.

block and wedges for doing this are shown in Fig. 2. The block B is of wrought iron 9¾ in. long, 6 in. wide and 6 in. high, and is cut out to fit over the main rod bearing on the crank pin. After the main rod strap and the rear brass have been removed, and the rod has been pushed forward out of the way, the block is slipped in in its place and fits easily between the inside of the crank arm and the side rod bearing. The keyways in the block have a taper of ¼ in. in 6 in., and the crank arm is wedged off by driving the two soft steel keys in them. This kink will easily start the most obstinate crank arm without defacing it.

OIL BURNER.

A simple and convenient portable crude oil burner is shown in Fig. 3. The oil tank was made from a 16-in. x 33-in. air reser-

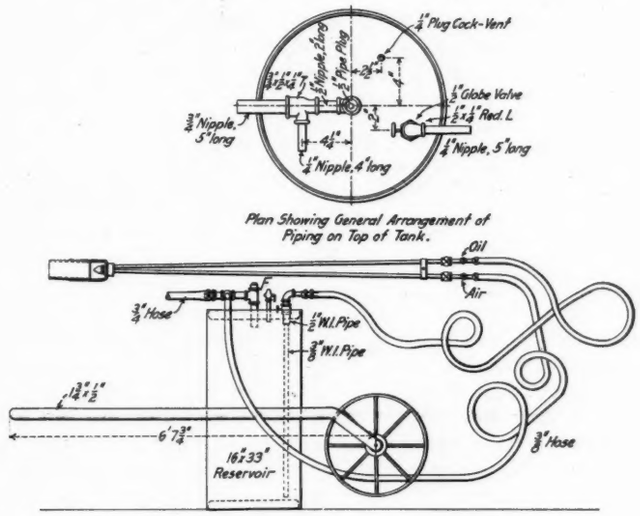


Fig. 3—Portable Crude Oil Burner.

voir. Air is admitted to the tank through the connection at F, the pressure forcing the oil out through the ⅜-in. pipe and hose. The construction of the burner is clearly shown in Fig. 4. The supply of oil and air to the burner is controlled by the globe valves. The oil tank may be refilled by removing the

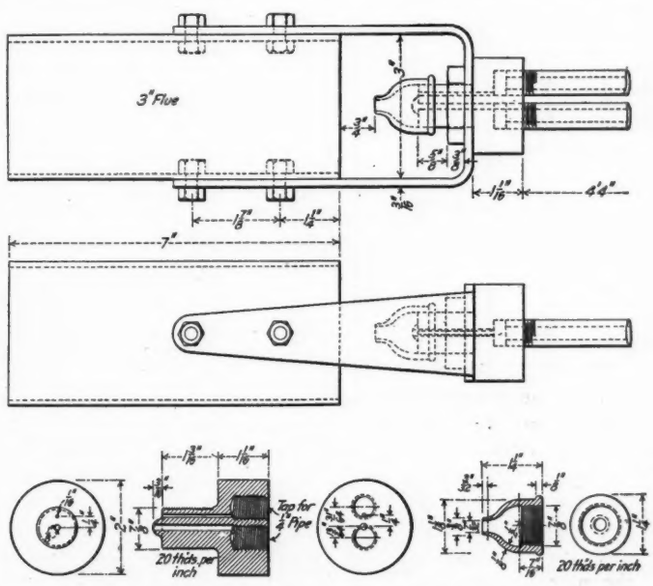


Fig. 4—Details of Torch on Crude Oil Burner.

plug at F. Air pressure is used at from 75 to 100 lbs. per sq. in. The handles of the truck are made of ½-in. x 1¾-in.

wrought iron, and are tied to each other by two ⅜-in. holts on either side of the tank, the arms being properly spaced apart by 6-in. lengths of pipe through which the bolts pass.

SAFETY CLAMP FOR BOILER TEST HOSE.

A strong safety clamp for the hose which is used for testing locomotive boilers in the engine house, is shown in Fig. 5. The large end of the clamp, which is made of wrought iron, fits over the hose, while the small end clamps over the nipple. Two

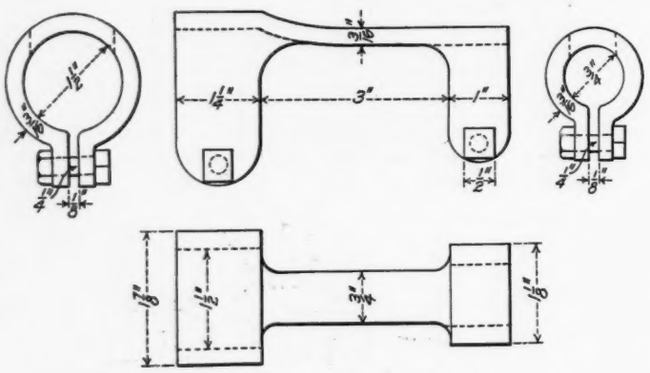


Fig. 5—Safety Clamp for Boiler Test Hose.

of these double clamps are used—one where the hose is connected to the engine house test line, and the other where it is connected to the boiler.

PAINT SPRAYER.

A simple and efficient paint spraying apparatus is shown in Fig. 6. The can is made of heavy galvanized iron, and the paint is introduced through the opening A, which when the can is in use is securely covered by the cap C. The cap has a rubber disk on the inside at the top, making the joint air tight. A hose from the shop air line is connected at B. By opening the valve, which is controlled by the lever H, air is allowed to escape through the nozzle G, which is an ordinary ¼-in. tee. As it rushes out it syphons the paint through the pipe, which is connected to the bottom of the oil can. The paint should be mixed sufficiently thin to flow freely. A handle E is attached to the side of the can for convenience in handling.

WAGON FOR MOUNTED WHEELS.

An important advantage of the wagon for mounted wheels, which is shown in Fig. 7, is the fact that it will turn in its own length, and can thus be used successfully in getting around sharp corners in a crowded roundhouse. It is made of a 2-in. x 12-in. oak plank, 6 ft. long, which is hung from its center on the wrought iron axle. The wheels are 10 in. in diameter and have 3-in. treads. The oak plank is stiffened and strengthened by the two trusses of ½-in. x 2-in. iron, which lip over the plank

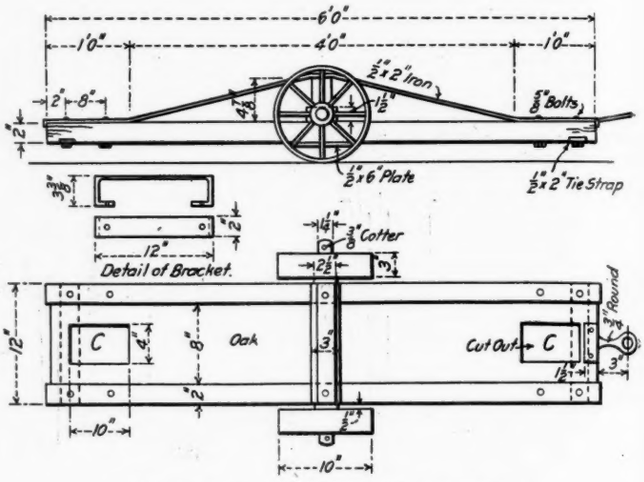


Fig. 7—Wagon for Mounted Wheels.

at its ends and are securely bolted to it by the ⅝-in. bolts. A bracket of ½-in. x 2-in. iron over which the truss straps extend is bolted over the axle. A ½-in. x 2-in. strap is also placed across the plank on the under side at each end. The top of the wagon is only a few inches above the floor, and the wheels can readily be rolled on it by using a set of iron, or iron faced wooden wedges, which may easily be carried on the wagon. These are usually made 6 in. wide and 18 in. long, and of the proper height to suit the wagon. As the wheels are rolled on the wagon they drop into the recessed parts C, which prevent them from rolling off. The wagon may easily be moved about by placing a rope through the eye-strap at the end.

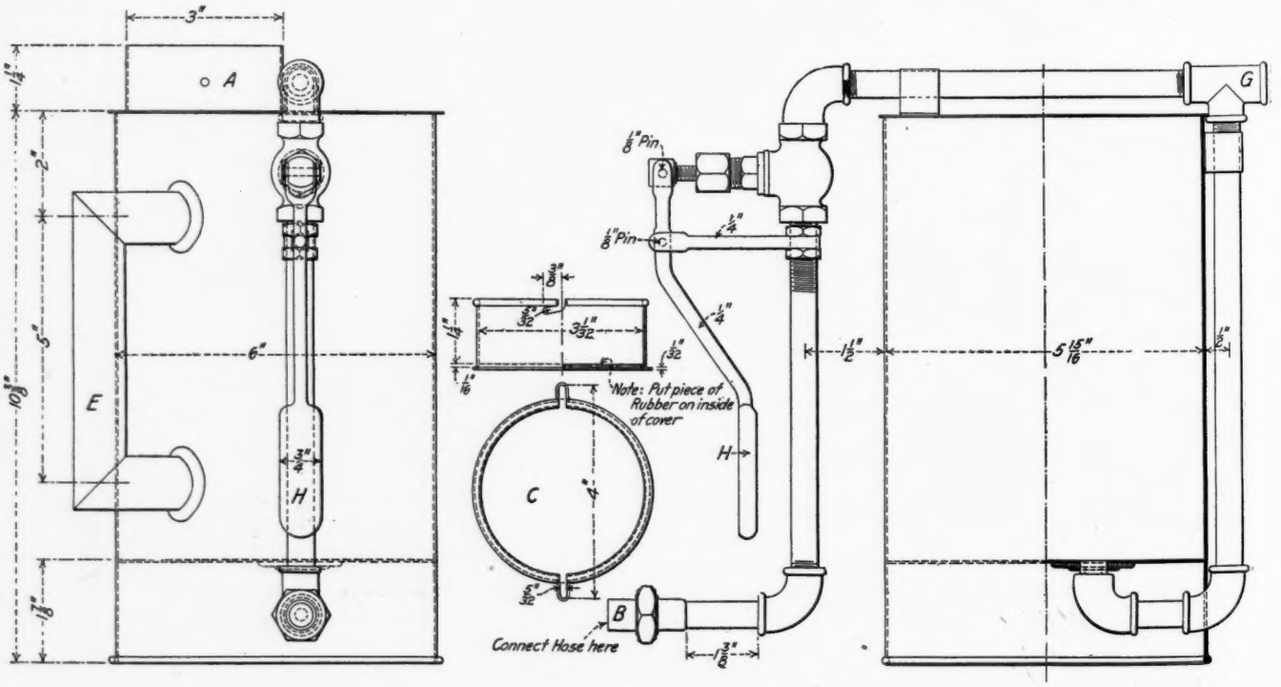


Fig. 6—Pneumatic Paint Sprayer.

PNEUMATIC HOIST.

A pneumatic hoist with a trolley and an overhead track is a most convenient means of handling heavy material about the pits in an engine house. If the trolley tracks are arranged in U shape, the legs of the U extending along each side of a pit, each one of them will serve three pits, thus requiring a minimum number of hoists. An air hose extending from above the center

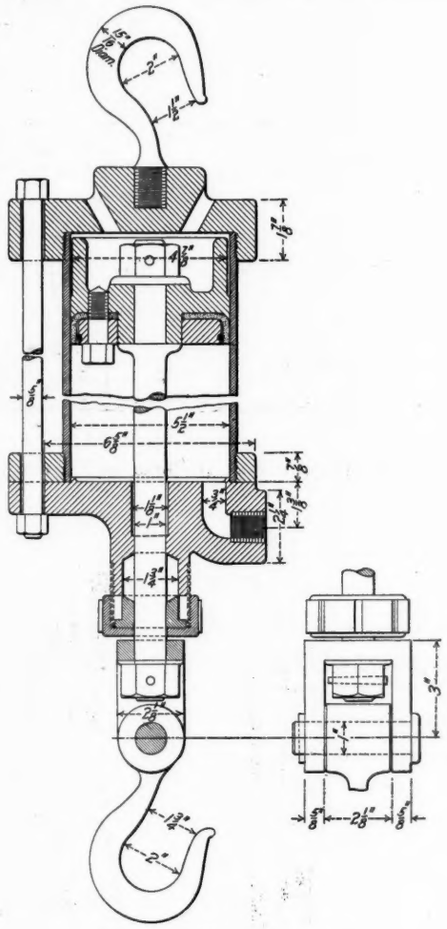


Fig. 8—Pneumatic Hoist.

of the middle pit can be made to follow either leg of the U. The hoist which is shown in detail in Fig. 8 has a capacity of from 1,200 to 1,500 lbs., and can be made any desired length. The cylindrical portion is made of brass, but heavy iron pipe may be used after it has been properly smoothed inside, or cast iron may be used. In the latter case, the wall should be not less than ½ in. thick. The construction of the hoist is clearly shown on the drawing.

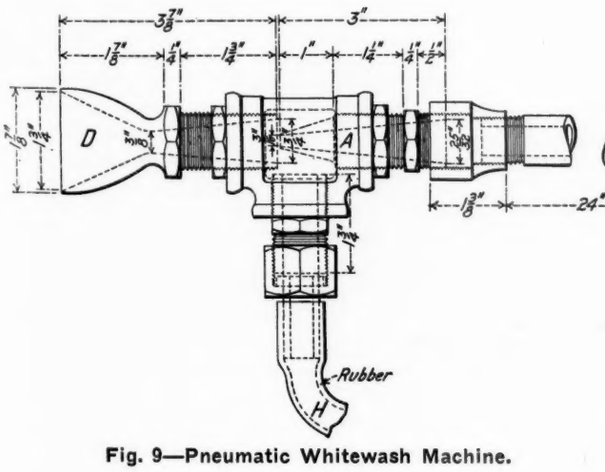


Fig. 9—Pneumatic Whitewash Machine.

PNEUMATIC WHITEWASH MACHINE.

Large areas of wall space and roof in a roundhouse or shop can be quickly whitewashed by the use of the pneumatic machine shown in Fig. 9. It is made of an ordinary ¾-in. tee, having an air nozzle, A, connected with an air line, projecting into one end. At the opposite end of the tee is a discharge nozzle, D, which is flared out in order to spread the whitewash

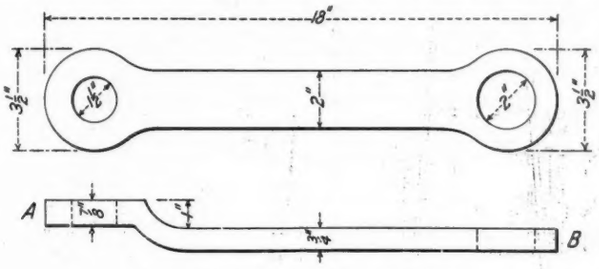


Fig. 10—Cylinder Head Lifter.

to the best advantage. The globe valve G has its construction modified so that the admisison of air from the pipe B to the nozzle A may be controlled by means of the handle E. Air from the supply line is used at a pressure of from 75 to 100 lbs. per sq. in. The whitewash is syphoned up through the

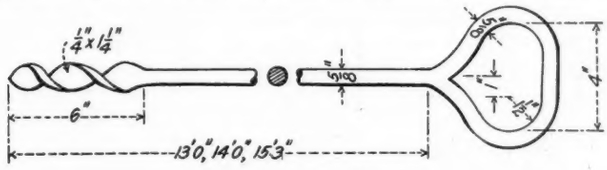
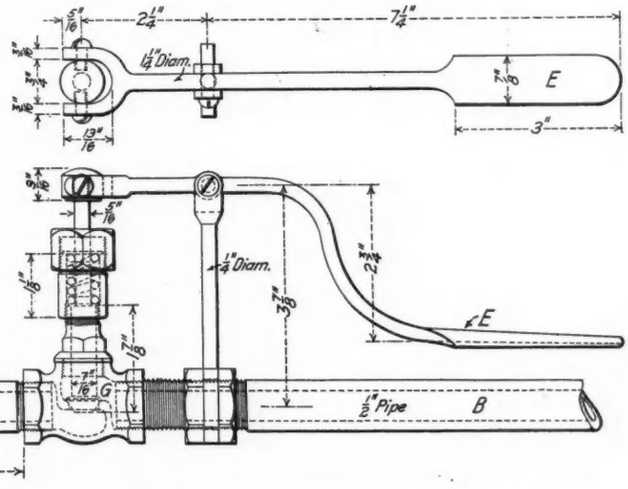


Fig. 11—Flue Auger.

rubber hose, H, and is sprayed out through the nozzle, D. It is usually prepared in a barrel and is made quite thin, so as not to clog the hose. The air pipes are standard ½-in. pipe, and the various connections are of brass. An ordinary garden hose will answer for handling the whitewash.

CYLINDER HEAD LIFTER.

A simple device for handling cylinder heads when they are



removed or replaced with the aid of a portable crane, or by one suspended from the smoke stack, is shown in Fig. 10. It is made of soft steel, the end A fitting over the stud at the center of the cylinder head. The other end is formed into a 2-in. eye to fit in the crane hook.

FLUE AUGER.

A simple flue auger is shown in Fig. 11. The handle is made of ⅝-in. round iron, to which is welded the flat twisted ¼-in.

x 1¼-in. soft steel stock. This auger may be made in any length, the three lengths used in our engine house being shown on the drawing.

PORTABLE 1½-TON CRANE.

A portable 3,000-lb. crane, which may be used to advantage in either the engine house or the erecting shop, for such work as handling steam chests and covers, cylinder heads, guides, crossheads and bumper beams, is shown in Fig. 12. The base of the crane, which is mounted on the wheels, is a heavy iron casting, the general design of which is shown in Fig. 13. The front axle is pivoted at the center and is offset; the handle is rigidly fastened to this axle and when it is raised the front of the bed drops until the lug A rests on the floor, thus steadying the crane. The upper frames, B, of cast iron, are securely bolted to the base and are reinforced by the ½-in. x

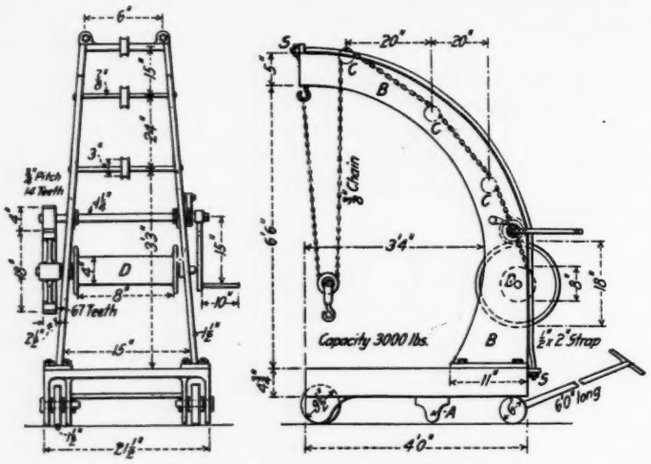


Fig. 12—Portable 1½-Ton Crane.

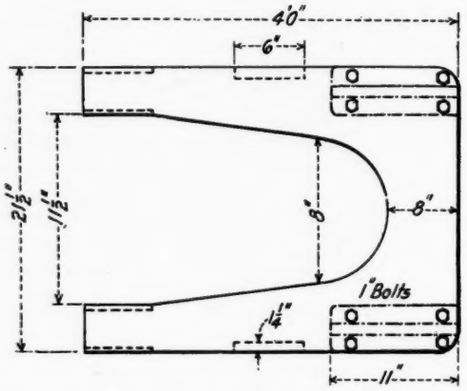


Fig. 13—Cast Iron Base of Portable 1½-Ton Crane.

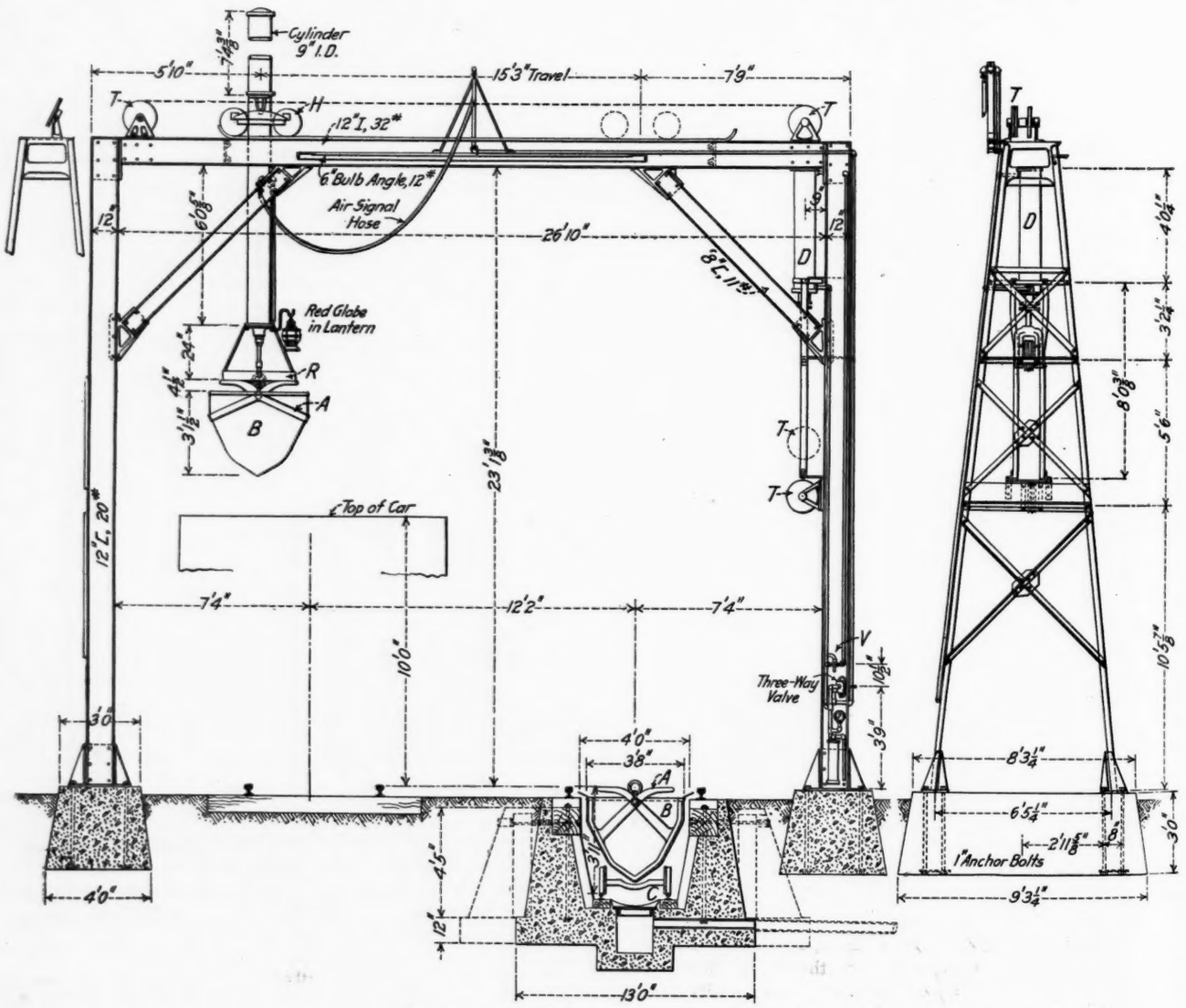


Fig. 14—Pneumatic Hoist at Cinder Pit.

2-in. iron straps which pass through the lugs, S, at the upper and lower part of the frame. The chain runs on the drum, D, and passes over the sheave C. A ratchet and pawl are provided for locking the drum and thus holding the load at any height.

PNEUMATIC HOIST FOR CINDER PIT.

The efficient operation of an engine house depends to quite an extent on the facilities that are provided for handling ashes and cinders at the ash pits. An admirable arrangement for doing this is shown in Fig. 14. The framework for the hoist is supported on a substantial concrete foundation, and consists of 12-in. channels, 20 lbs. per foot, at the sides, securely braced by angle irons and straps as shown. The top cross members of the framework are 12-in. channels, 32 lbs. per foot. The framework extends over two tracks; one at the ash pit and one for the cinder cars. The construction of the ash pit is clearly shown on the drawing. The number of ash buckets, B, which are supported on the four-wheel trucks, C, depends on the length of the ash pit and the service which is required of it. When

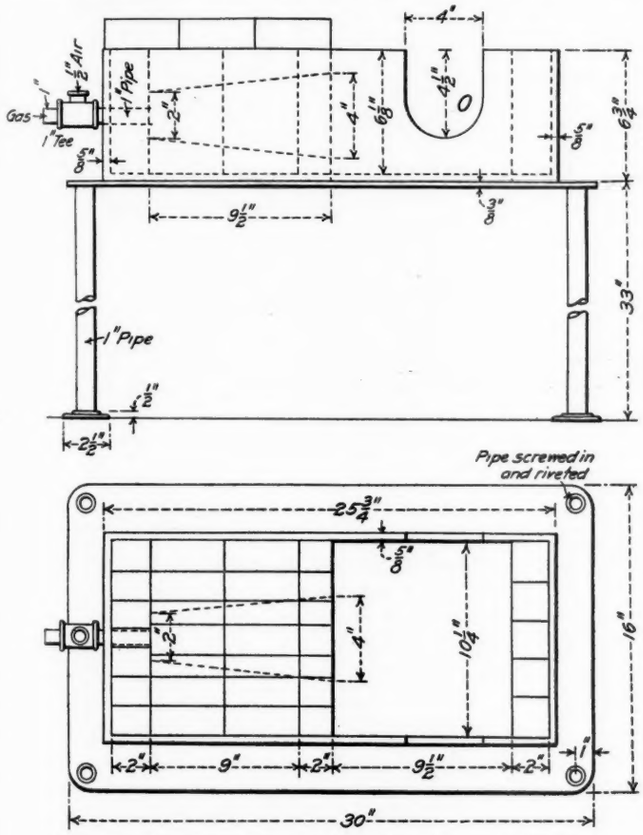


Fig. 15—Gas Furnace for Pipe Bending and Brazing.

one of the buckets, B, has been filled and run underneath the framework the overhead hoist, which is supported from the small truck which operates on top of the 12-in. eye beams, is placed directly over the ash pit by manipulating the handle of the valve on the column at the side of the pit. Valve V controls the admission of air into the cylinder D, which is fastened to the side of the framework. By the system of pulley-wheels T, one of which is fastened to the end of the piston rod of cylinder D, and by means of a wire cable which passes over these pulleys, and which is fastened to the truck, H, the latter may readily be moved back and forth over the two tracks at will. To steady the piston rod it has a crosshead at the end which runs in guides fastened to the side of the framework.

The 9-in. hoisting cylinder which is supported by the truck, H, is operated by the three-way valve, and the piston rod may be allowed to drop to such a position that a hook at its end may be engaged with a link on the ash pit bucket. The bucket may then be lifted from the truck, and by operating the valve which controls the cylinder, D, may be transferred directly over the ash car. Then by raising and lowering the bucket slightly and allowing the upper end of arm A to strike the heavy iron ring R, which is rigidly fastened to the bottom of the cylinder head, the two halves of the bucket may be made to open outward, allowing the ashes to fall in the car. Allowing the piston to drop slightly, closes the bucket again and it may then be moved over and dropped onto its truck, and another truck with a full bucket may be run under the hoist, and be dumped in a similar manner. The carriage of the truck, H, is fitted with a cast iron yoke which allows the cylinder to swing a considerable distance in any direction. The ash bucket trucks are constructed of 2½-in. x 2½-in. angle iron, and have heavy forged axles with cast iron flanged wheels.

GAS FURNACE.

A simple and durable gas furnace used for pipe bending and brazing in the engine house is shown in Fig. 15. The box, which is 6¾ in. high and about 24 in. x 10 in. inside, may be made either of cast iron or of iron plates. It is partially lined with fire bricks as shown. The gas which enters the 1-in. tee through the 1-in. pipe is mixed with air, which enters through the ½-in. pipe; this mixture is forced into the furnace through the 1-in. pipe, the opening in the fire brick increasing in diameter from 2 in., where the gas enters, to 4 in., where the fire brick ends near the center of the furnace. That part of the pipe which is to be heated is laid across the furnace in the depression O, where the heat is intense. Fire bricks protect the back wall of the furnace. The gas is used at a pressure of about 6 oz., and the air at about 70 lbs. per sq. in. The furnace is placed on an iron plate ⅜ in. thick, 16 in. wide and 30 in. long, which is supported on four legs of 1-in. pipe. The device is comparatively light and if desired may be moved about the engine house if suitable air and gas connections are provided.

OXY-ACETYLENE WELDING.*

BY R. W. CLARK,
Foreman Boilermaker, Nashville, Chattanooga & St. Louis, Nashville, Tenn.

A number of service tests of welds in fireboxes of locomotives indicates that the oxy-acetylene welding method is a success. On one of our large passenger engines, steam pressure 210 lbs., we applied two large patches on the side sheets. The engine then went into service for nine months. When it came back to the shop, we removed the side sheets because of cracks in different places, such as the horizontal seams in the firebox and cracking of the sheets above and below the stay bolts; the patches also cracked in different places, but the weld was in good condition. To apply any kind of a satisfactory patch at this place is a very difficult job, and the oxy-acetylene weld was far superior to any other that might have been made. The patch cracked within one inch of the weld, but the weld stood.

We also have two other patches in the firebox of a smaller boiler, carrying 160 lbs. pressure, which have made quite a record. After making 65,000 miles the engine is now in the shop for general overhauling and the patches are in good condition. It is hoped that they will make double this mileage. These patches are 5 ins. x 24 ins. and are directly under the brick arch. There is also a small patch welded in over the fire door on the flanges. This engine would otherwise have had to have received two new side sheets twelve months ago. Patches applied at this place with patch bolts will give no end of trouble in the round house and will possibly have to be renewed once or twice.

We have two patches, 70 ins. x 24 ins., in one of our large freight engines on both side sheets, just above the grate bars. This boiler carries 195 lbs. pressure. These patches have been

*An extensive article on the methods of oxy-acetylene welding and cutting, used in the Nashville, Tenn., shops of the Nashville, Chattanooga & St. Louis, and prepared by William G. Reyer, general foreman, and Mr. Clark, appeared in the *Railway Age Gazette* of August 5, 1910, page 243.

in service for five months and have given no trouble whatever. This engine also has a flange welded at the fire door. When the engine arrived in the shop, it would have been necessary to apply two new side sheets and a half door sheet had it not been for the oxy-acetylene welding. The repairs were made at a very small expense compared with what it would have cost to remove the side and door sheets.

We have had several sets of half side sheets welded in. Two of them have made their mileage and have gone through the back shop for a general overhauling. On examination the welds were found to be O. K. We have welded hundreds of small patches in low-pressure boilers which have given no trouble whatever.

There are some places which cannot be welded successfully. However, the method is only in its infancy, and there is apparently no end to the work which can be successfully done, if handled in the proper way. We have more than sixty locomotives with oxy-acetylene welds in different parts of the boiler. This method of welding is also used for a great variety of work in the erecting and machine shops.

For cutting purposes in the boiler shop it is invaluable. I have often sent the operator in on a big job, and in three hours or less he has done as much work as would have been done by three or four boilermakers and helpers in several days of hard work, and the operator used only one and one-half tanks of oxygen. There is nothing better for cutting up old material.

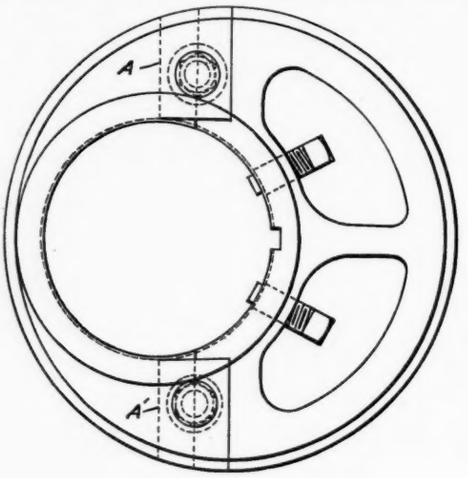
CAST IRON WHEEL FOR 60-TON CARS.

The Utah Copper Company has received some steel hopper cars from the Pullman Company having a capacity of 120,000 lbs., and the wheel and axle used under them are here illustrated. The heaviest M. C. B. standard wheel for 50-ton cars with a gross load of 152,000 lbs. weighs 725 lbs., and this may be compared in its proportions with the 800-lb. wheel for the 60-ton cars, which was designed and made by the Griffin Wheel Company, Chicago. The gross load for the 60-ton car is 170,000 lbs. The thickness of the tread in the heavier wheel is 2 in., the same as the M. C. B. 725-lb. wheel. The thickness of the double plates has been slightly increased, the outer plate to 1¾ in., the inner plate to 1⅛ in. and the single plate to 1 3/16 in. The principal change is in the inner projection beyond the flange, which makes the total width of tread and flange very nearly 6 in., as compared with 5⅝ in. in the M. C. B. standard section for 50-ton cars. This makes a novel shape for the flange and increases the thickness in the direction where needed for greater strength; it has been found to make a proper blending of the white and gray iron at this critical point. The increase in the total width at the tread will also add materially to the strength of the wheel. The thickness of the bracket has been increased from 1⅛ to 1¼ in., and the height from 2 in. to 3 in. The increase in the height of bracket is due to the fact that the single plate in the new heavy pattern is located farther out on the rim, so that the curve joining the plate and the rim increases the thickness of the rim rapidly.

The large axle required for the 60-ton cars is shown on the drawing, and it may also be compared with the M. C. B. axle for 50-ton cars designed to carry 38,000 lbs. The new axle should carry 42,000 to 45,000 lbs. The length over all and the length of the journal is the same for each axle. The diameters are increased 1 in. all through, the journal being 6½ in., wheel seat 8 in., and center 6⅞ in. These are convenient figures to remember and to work to, but they may be larger than necessary, and it seems desirable for the M. C. B. Association to adopt another standard axle suitable for cars with a nominal loading of 60 to 65 tons.

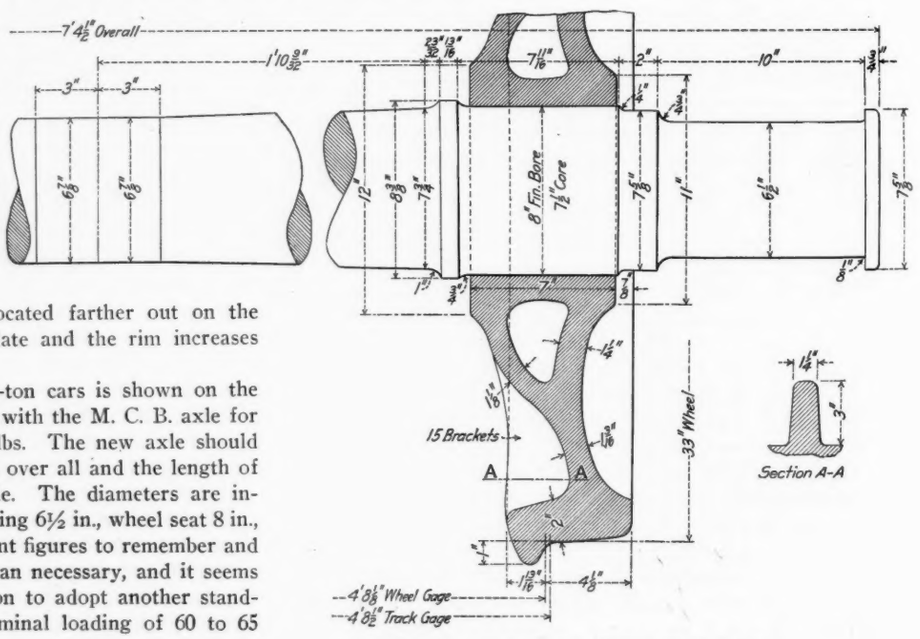
SPLIT ECCENTRIC.

It is frequently necessary to use split eccentrics on locomotives, and in some places it is preferred to the solid type. The accompanying illustration shows a strong construction for a split eccentric that has been used on the Baltimore & Ohio, which does not require that the division line shall be central with the axle, and with which the bolts are relieved of all stress. The main parting line A A¹ is on the center line of the axle, but the small side



Split Eccentric.

of the eccentric has an overhang, B, with a lip engaging in a recess in the larger portion. The two parts are held together by a single bolt on each side with countersunk head and nut. With this arrangement the bolts carry none of the stress of the eccentrics, this being taken by the lips and serve merely to hold the two parts together. No hub is required and the eccentric is held in place on the axle with a key and set screws in the usual manner.



Wheel and Axle for 60-ton Freight Car.

THE MISTAKES OF THE EFFICENCY MEN.*

BY ONE WHO HAS WORKED WITH THEM.

IV.

Unscinetific.

The efficiency men are rightly to be judged both by their utterances and by their success or failure to work out in a practical way the theories they stand for. In the case of the former, much has been said and written to which as thoughtful men as they have taken exception; as to the latter it will doubtless be admitted even by the efficiency men themselves that their success has in many, if not most, cases been questionable. The attempts that have been made to establish their systems on railways have been so few that railway men are necessarily led to investigate the claims that have been made of what has been accomplished in manufacturing plants. Railway men are not opposed to scientific management, although they have been so represented. They do object, however, to the manner in which so many of the efficiency engineers have exploited as a new and wonderful departure in the field of industrial and railway operation, many of the methods that have been recognized as fundamental and have been worked out to a successful conclusion in most of the representative railway shops of the country. The same may as properly be said of manufacturing plants, in many of which efficiency men have found it impossible to make sufficient progress to warrant the cost of the introduction and establishment of their systems.

Much of what they have said and written has been allowed to go unanswered. The popular publications have welcomed them as the bringers of good news, who are to save us from the slough of inefficiency. Their statements appear to be accepted as scientific deductions which require no further proof. But merely to discuss scientific questions does not make one a scientist, and one of the fundamental weaknesses of their position lies in the fact that, posing as scientists, they have made statements and set up claims in disregard of the actual conditions. In what respects then are many of the efficiency men unscientific in their attitude and methods with reference to scientific management?

First, in basing their conclusions on incorrect, insufficient, or immaterial data and in applying them to conditions which were absent in the initial investigation.

Second, in criticizing methods of operation without a full recognition of what they have accomplished and in substituting therefor a system which experience has shown to be impracticable.

Third, in their impatience for results.

UNSCIENTIFIC METHODS OF DRAWING CONCLUSIONS.

What is more common in their utterances than an imposing array of examples of extremely low efficiency, submitted as evidence that conditions call for heroic treatment, or of examples of high efficiency as a proof that their methods can alone bring order out of the chaos? A mere citation of disjointed facts, however, proves nothing. They are at best but half-truths, and as such are not only out of place in a scientific discussion of the questions under consideration, but are misleading. A disinterested seeker after the truth asks: "If the unsatisfactory conditions that have been described actually exist, are they due to a *wrong* system or to the *absence* of system; do they correctly represent average conditions, or are they only exceptional instances due to factors which are but local and transitory?"

Efficiency men claim to be scientific, as contrasted with practical men, who they say, follow the rule of thumb. But a scientist publishes his conclusions only when, after extended experiments and observations, he has found the evidence sufficient to warrant giving them publicity. He is no scientist who hastens into the limelight with evidence based on scattered examples, found amid varying conditions, and risks the odium of his co-workers by announcing premature conclusions. Among reputable physicians, chemists, biologists and other scientists, it is customary to delay the announcement of important discoveries even far beyond the time which would seem under all the laws of logic to be required. The result is that when such an announcement is made it is backed up by a series of facts so closely related and so strongly fortified by innumerable examples bearing distinctly upon the question, that it is unusual, indeed, for it to require alteration.

Is it scientific to use as evidence cases of low efficiency and consequent high costs and unsatisfactory service, or of improvements that have followed the introduction of efficiency methods, without an equally fair statement of all the conditions that surround the operations? Or to search through the records for an especially poor performance to set alongside an especially good one, irrespective of the causes and the general tendency in either case? All thoughtful accountants appreciate how misleading statistical data may be unless all the concurrent factors are taken into consideration and proper allowances made for them. Whatever the unit of measurement, it is unsafe and improper to draw definite conclusions from too narrow a range of data.

A good record of one month may really be a poor one when all the facts are known. For example, in an industry where the different operations that precede the completion of a certain unit are scattered over a period of several months, the output during a particular month may, and usually does, bear no direct relation to the cost of operations during the month in question. In a shop building steam engines, machine tools, passenger cars, or similar equipment, requiring perhaps two months or more to assemble complete, it is the height of folly to assume that the cost of the operations in a given month divided by the output represents the cost per unit, and indicates whether the results are satisfactory or otherwise. Yet this has been done and has been submitted as evidence in proof of the alleged phenomenal results that have followed the introduction of a certain system of shop operation.

We can judge of the value of claims of this nature—disjointed statistics that in themselves ought not to be accepted as proving anything—only from those with which we are familiar. In an article explaining the gospel of efficiency, written by one of the chief of its apostles, an example is cited which if accepted at its face value and as representative of average conditions, is certainly a strong endorsement of a new system which is claimed to be "as different from the old as the rifle is from the bow." The example given is that of a large industrial plant, the owners of which desired to increase the output from 13 to 23 units per month. It is said that the manager recommended an expenditure of a large sum of money for the purpose. The efficiency engineers, young lochinvars out from the West, however, after making their usual investigation reported not only that *no* expenditures for extensions were required, but that the output could be increased 60 per cent. within a very short period, without adding either to the equipment or the force, or increasing the payroll more than 10 per cent. (the increase that was anticipated undoubtedly represented bonus). Evidence is then submitted for the purpose of proving that the results were even greater than had been forecast. It is claimed that within the time allotted the output had increased 69 per cent., and that the payroll, far from increasing, had been reduced 15 per cent. Nothing is said about the expenditures for equipment, but the conclusion is that the suggestions of the efficiency engineers having been followed in other respects, were followed as well with reference to property expenditures.

The writer has received authoritative information regarding this particular case that throws a different light on the subject. Bearing in mind that disjointed statistics cannot be relied upon, what facts were ignored in citing this example as a proof of the

*The first article, which considered the extravagant statements and claims made by efficiency engineers, appeared in the January 6 issue. The second article, on the failure of many of their theories when put to the test of practical application, was published in the February 3 issue and the third, on their neglect of the human element, appeared in the March 3 issue.

results achieved by the efficiency men? It was true that the output for one month had been 22 units as compared with an average during the previous year of 13. But one robin does not make the spring. The actual results were: 1, For a period of six months immediately preceding the introduction of the new system, the average output had been 14. 2, For the next nine months the average output was 15½, an increase of 1½, or 9 per cent. 3, For the month immediately *preceding* that in which it was 22 (the ideal to be reached), it was 14. 4, During the month immediately *following* the output was 7, and the plant then closed down for want of work. It should also be stated that a large amount of money was expended for improvements, although the "assay" of the efficiency engineers indicated that none was required, and that the reduction in cost of operations *per unit* was almost negligible. It is apparent from even a cursory examination of these figures that the "evidence" was to say the least, misleading. The output had not increased as stated. There were local reasons why in the particular month mentioned it was larger than previously. That it was not due to any revolutionary change in the methods of operation is apparent from the fact that during the month immediately preceding it, the output had been *less* than the previous average. That the pay roll had been reduced, was due only to the fact that many of the shops had been closed down, only the assembling shop, where output is counted, running full. Further interesting facts in connection with this particular case, which were omitted in the article using it as evidence, are that the system as introduced by the efficiency engineers was afterwards discontinued, and that much better results are being secured. From whatever point of view the example cited by the efficiency engineer may be considered, the conclusions reached were certainly not arrived at *scientifically.*

Another instance, based on insufficient data, is the following: In a recent discussion in one of the leading New York dailies the statement was made by a prominent efficiency engineer that "the losses occurring in many items of railway operation have been checked on a large scale," and it is asserted that, based on such extensive checking, the conclusion is justified that they mount into the hundreds of millions. This alleged loss has been used as head-line material for many months and has served as a text for numerous articles in current publications by men who have accepted it as gospel. They have, however, overlooked a still more pregnant statement in another article by the same authority as follows: "The net earnings of the railways in 1909 were only $1,078,132,735, but sympathy is not so great as it would be if it were not so evident that wastes were annually occurring, a very large part of them preventable and *aggregating a sum larger than the net earnings*" (the italics are ours). Evidently an error was made when it was stated that the losses amount to a paltry $1,000,000 a day; they are actually $3,000,000 a day, "a very large part preventable." Are these the conclusions of a scientist? Where and when have efficiency engineers checked railway operations on a large scale? Have 20 per cent., 10 per cent. or even 5 per cent. of the multiplicity of factors that affect railway economics been analyzed by them? Is it not a fact that they have been checked only on a few roads and that even where the conditions were subjected to their scientific treatment, such treatment has failed? The evidence of economies effected on the Santa Fe has already been shown in the *Railway Age Gazette* to be such that it can not be seriously accepted. As already stated, such statistics are valuable only when covering a period of time sufficient to represent average conditions.

In a pamphlet going the rounds among railway and industrial managers, an instance is cited of work being done by 40 men through the introduction of a system of planning and routing, on which 120 had previously been used. Another efficiency engineer refers to a locomotive being repaired at a cost of over $600, which should have cost $27. Without questioning the accuracy of such statements we submit that their recital does not prove that these unsatisfactory results are due to the failure of systems of operation which are well established in most representative shops. They are the result of mismanagement and the absence of system, over which almost any definite plan, however crude, would be an improvement. If an investigation were made of conditions in the shops where marked reductions in cost have been made by the introduction of the methods employed by efficiency engineers, it would doubtless be found that in many cases they had previously been allowed to run themselves. It is, therefore, unscientific to make use of such cases in a wholesale denunciation of the methods prevailing in the average railway shop.

But the reader, left in such cases to his own resources to separate the real from the unreal, is either the willing and unsuspecting neophyte, accepting with wonderment the "evidence" which has no established basis, or is obliged to reject it all as unreal. It is unfair to those among the efficiency engineers who are scientists in the true meaning of the term. There is danger that their reputations will suffer and that their usefulness will be limited because of the unscientific deductions and absurd claims of the pseudo-scientists who ransack heaven and earth for comparisons that only serve to mislead those who are not in position to answer their arguments.

IMPRACTICABLE METHODS.

Efficiency men as a rule are opposed to piece-work as being unscientific, expensive and tending toward too great effort on the part of the men. As to the first, it may be admitted without question that there have been, and are now, piece-work prices in use which are unscientific in that they have not been determined correctly. This, however, is a condition, not a principle, and can be corrected as easily as similar conditions can be rectified in connection with the standard time and bonus system which is offered as a substitute. The prices paid for the various jobs in shops which are recognized as having successfully introduced the piece-work system are determined only after a careful investigation of all the factors that affect them. In certain shops, as in the case of the Canadian Pacific, time studies are made; in others, the equivalent of the time study, observation by a trained observer, although without resource to the stop watch, is sufficient. In others, the prices now in use have been the result of an evolution, which has involved extensive checking and comparisons, and are therefore accepted as satisfactory. Whatever may be the actual situation in this respect, however, the conclusion is inevitable that any method that may be considered practicable in the determination of standard times may be used as well in establishing piece-work prices.

As to the expense, this can refer only to the amounts paid for the work done. It cannot refer to the cost of introducing the system, for the reason that in many plants the standard time and similar systems have been found impracticable, if for no other reason, because of the high cost involved in their introduction and maintenance. Why piece-work should be more expensive in so far as the cost of output is concerned is difficult to understand. If it be said that high prices are necessary in order to interest the workmen, it may be replied that equally high guaranteed day rates are demanded as an incentive to accept standard time. And there are many successful managers, who know from bitter experience that the latter is much more objectionable than the former.

It is one of the theories of the efficiency men that the acceptance of their various systems of shop operation carries with it greater comfort to the worker. To quote from one of them: "It is the belief of scientific managers that men find more pleasure in working quickly and well than in working slowly and poorly, and especially would scientific management object to automaton specialization and the exhausting strain so often induced by piece rates." As to the first, "'tis a consummation devoutly to be wished," in the search for which as much may be done, and is being done, under a properly established piece-

work system as under newer, but less practicable plans. As to the second, it may be said that so long as competition remains there will be those who choose, in spite of all that may be done, to work rapidly in order to earn more. It is not the universal testimony of managers of railway or industrial shops where piecework has been established that there is the "exhaustive strain," which is feared. As a matter of fact, it is seriously to be doubted that such conditions exist to a marked extent anywhere except in the shops usually known as "sweat shops." In any event, such an objection holds with equal force against the standard time and bonus system, for in any extensive effort to establish it, if a pacemaker can be found to lead the shop, every use is made of him. In practical operation, therefore, there is no difference, so far as the pace is concerned, between working for a high efficiency in order to earn a large bonus, and putting forth extra effort toward completing a greater number of pieces in order to increase one's earnings. The objections to piece-work are for the most part academic and theoretical. Is not the opposition to it on the part of the efficiency men due largely to their general attitude of criticism of the "old ways," and their desire to introduce something new to justify their position?

The impracticability of the standard time and bonus system, as it is usually known, has been proved in scores of attempts to introduce it. Under like conditions it has shown no economy over a successful piecework system; on the contrary, in many plants it has increased the cost of production. The expense incident to its introduction and maintenance is usually prohibitive; especially is this true when a shop is running at materially less than full output. It has led to prolonged and bitter labor disputes, and even in quarters where piecework is opposed, the opposition to the standard time system and bonus system is even greater. Its chief appeal to serious consideration lies in the stress it lays upon the necessity for a scientific study of all the conditions in determining shop methods, and for an accurate measurement of the time required in specific operations. These factors, however, are taken into account in all well-established piecework systems, which, in fact, have all the virtues of the standard time system without its objectionable features.

IMPATIENCE FOR RESULTS.

Perhaps next to the failure of the efficiency men to appreciate the importance of the human element, the most certainly fatal mistake they have made is their impatience for results. This comes often after many of the obstacles to their success have been removed. It is not confined alone to them; many practical managers have failed for the same reason. But in introducing a system of work that involves features, which while the principles underlying them may not be new, are strange to the men who are most vitally affected, impatience can undo in short order what it has taken much time and expense to build up. If it is true that man is a suspicious animal, the average workman has his full share when a new system is introduced. If it has merit, its success should not be risked by premature announcements or by assuming an uncompromising attitude toward the men. If there is great waste in shop operation, and this has been going on many years, why the impatience to change it all in six months or a year?

Instead of establishing the system in one department, and proving its worth so unequivocally that it is demanded in other departments, certain efficiency men have urged its speedy extension to other departments, for the reason that unless it is introduced into all and recognized as the established system, there is danger that it will fail in the department in which it was initially instituted. Such a necessity for its general extension is unworthy of any system which merits it. One of the most unfortunate results of the impatience that has caused shipwreck of so many well intentioned plans, is the opportunity that is given to labor to organize and present a solid front of opposition to their establishment. It is both unnecessary and unscientific to demand or expect permanently satisfactory results in introducing scientific management without giving it time to grow in favor. If the efficiency men have profited by this mistake, which has been the direct cause of many of their failures, they have gained much.

Just now scientific management is receiving consideration, either favorable or otherwise, in many quarters. There are those who believe that it offers nothing toward a solution of the problems that confront the industrial world. There are others who consider it a panacea for all our economic ills. Perhaps midway between these classes are those thoughtful men, some trained in the hard school of practical experience and possessing that true genius which is "an infinite capacity for taking pains," and others, with equal genius and with the instinct and training of the scientist, who are to be depended upon to extend the establishment of its principles. The purpose of scientific management is not to displace existing institutions. It is to perfect them. It has already been established on a much larger scale, although it may not bear the name, than many of the efficiency engineers are willing to admit. It is being further extended through patient study of existing conditions and a recognition of those factors which make for permanency. And while it is to be regretted that it is being retarded through misrepresentation and unfair criticism, it is an encouraging sign that there is a growing number of industrial and railway men of all ranks who are not blinded to its merits by the fulminations of the school of philosophers who may for the time being occupy the stage.

A CURIOUS CASE OF A WORN JOURNAL.

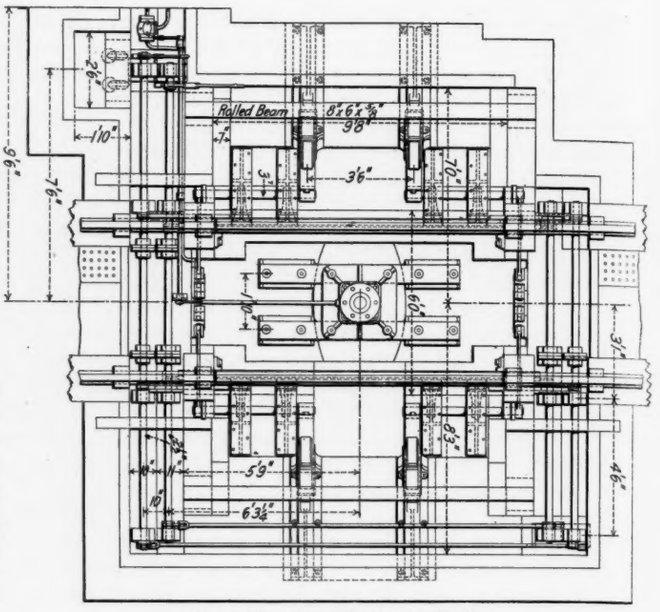
On October 22, 1910, a hot box was noticed on L. S. & M. S. car 72071 at York, about 25 miles from Youngstown, Ohio. The car was loaded with ore and was in a slow train. A Cook cooler was applied. On arrival at Youngstown the standard 5½-

Curious Case of a Worn Journal.

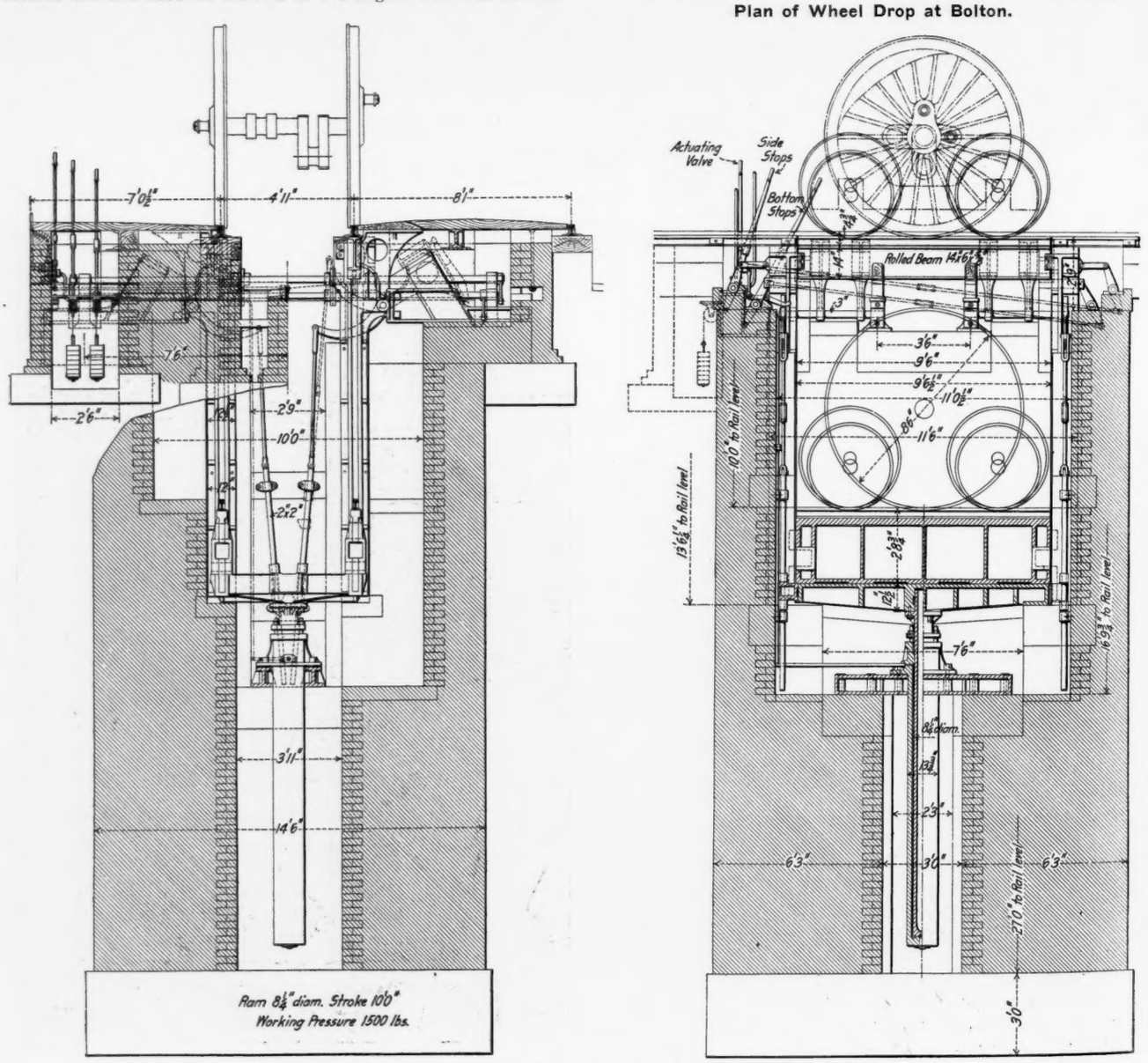
in. x 10-in. journal was found in the condition shown on the accompanying photograph. The axle was not bent, but the journal had been spun out and elongated from 10 ins. to 12¼ ins. The journal bearing was found to be badly cut and conformed to the shape of the journal. Why the journal, which must have been quite hot in order to spin out as it did, did not bend under the heavy load which it was carrying is a mystery. I. S. Downing, master car builder of the Lake Shore & Michigan Southern, to whom we are indebted for this information, has never seen anything like it in his experience.

TWENTY-TON HYDRAULIC WHEEL DROP; LANCASHIRE & YORKSHIRE.

At the joint meeting of the American Society of Mechanical Engineers and the Institution of Mechanical Engineers of Great Britain, Birmingham, England, a number of papers were presented on the subject of engine house practice. In the discussion John A. F. Aspinall, general manager of the Lancashire & Yorkshire, referred to the general practice in England by using shear legs for removing driving wheels from locomotives, but he thought that the drop pit was a much better method and described the one used on his line in the engine house at Bolton.



Plan of Wheel Drop at Bolton.

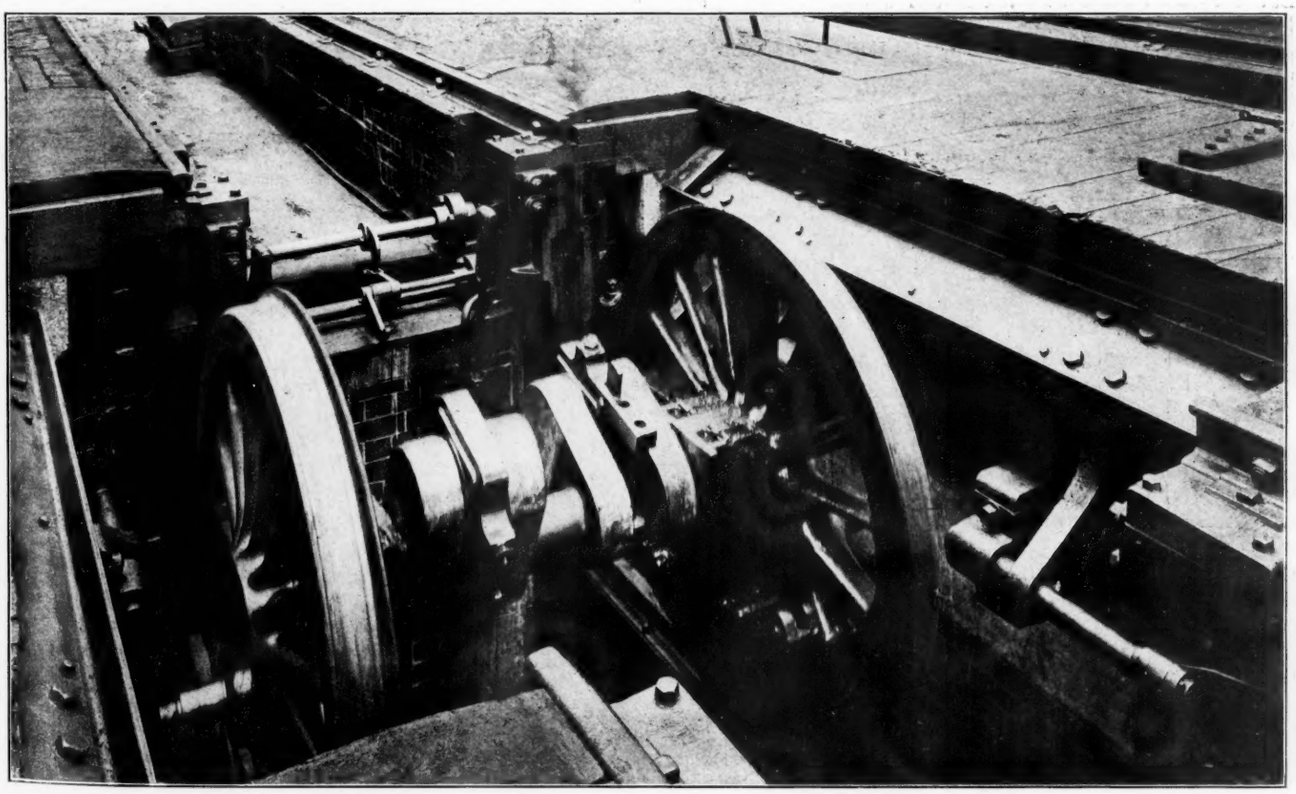


Hydraulic Wheel Drop, Lancashire & Yorkshire Railway.

Wheel Drop in Normal Position with a Pair of Wheels About to be Dropped.

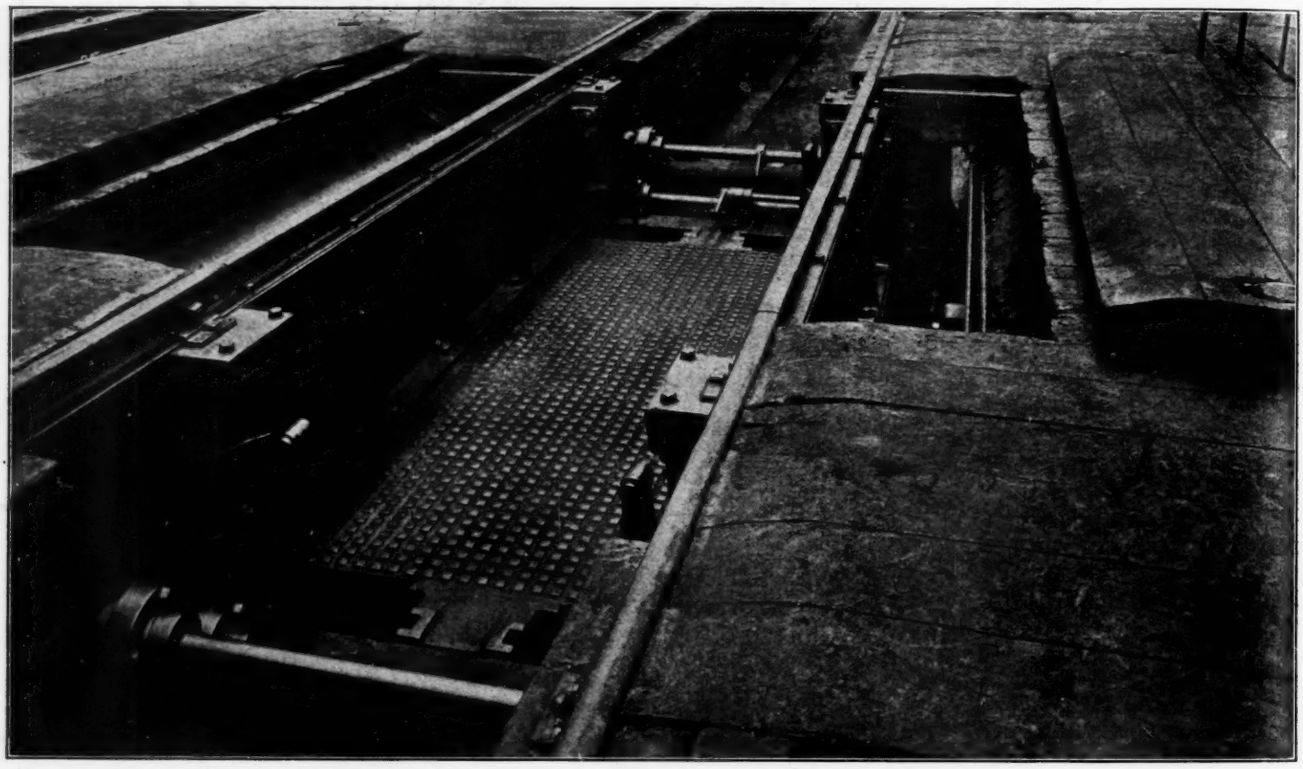
The accompanying drawings and photographs illustrate this wheel drop.

The cast iron drop-table is 9 ft. 6 in. long, and is operated by a hydraulic plunger 8¼ in. in diameter with 10-ft. stroke, under a working pressure of 1,500 lbs. per square inch. The drop rails are supported on cast iron ribbed girders 28 in. deep, and these are bolted to the plunger platform and guided by cast plates secured to the end walls of the pit. A peculiar feature of this wheel drop is the provision for two sets of supporting rails. These are made necessary from the fact that the



Pair of Driving Wheels Partially Lowered.

engine house is of the type known in England as the through running shed, and after the wheels are dropped and remain on the table rails in the pit, another set of rails must cover the gap in order to allow other engines to pass through the house. These rails are supported on a hinged structure and are thrown in or out of position by means of levers and rods which are operated by the motion of the hydraulic lift. The rails are secured to rolled I-beams, 14 by 6 by 5/8 in., an dthese are bolted to cast iron brackets which have bearings on their lower ends and are keyed to 3-in. round shafts. These shafts are connected by curved levers to rods which extend down to the plunger platform. When the platform is raised the hinged rails are thrown back so they can be covered by a hatch forming a portion of the floor. When the table rails descend the hinged rails are automatically thrown into position as a part of the through track. The hydraulic valves for the control of the plunger are operated by counter-weighted levers, and their location is shown in the photographs as well as in the drawings.



Wheel Drop in Normal Position, Except that Hatches at Side Are Removed.

APPRENTICE SCHOOL AT ALTOONA.

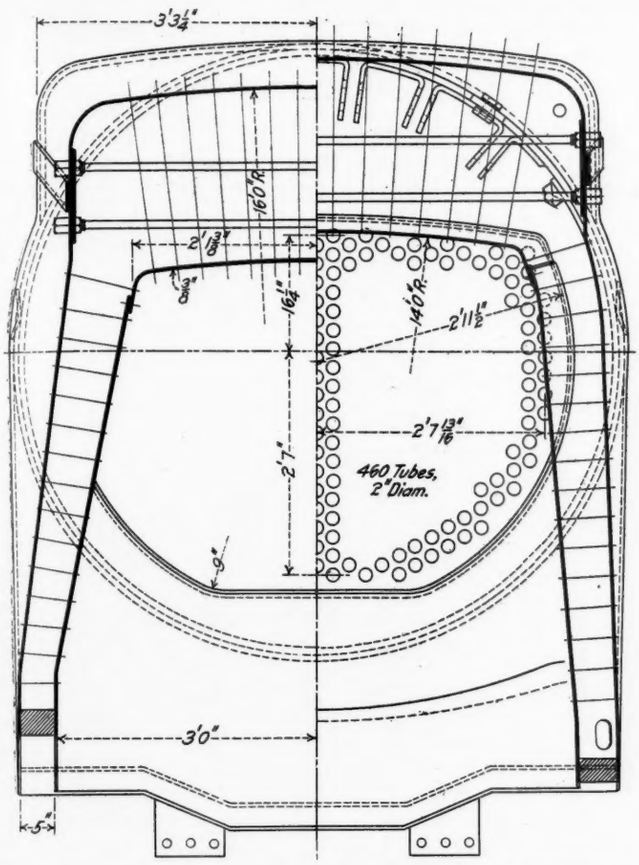
An apprentice school has been established at Altoona, Pennsylvania, by the Pennsylvania Railroad, co-operating with the engineering school of the Pennsylvania State College. It is for the benefit of the regular apprentices in the shops at Altoona. Its object is to give to apprentices a knowledge of the fundamentals of mathematics, mechanics and drawing, thereby making them better artisans. The large attendance shows that the men are eager to make the most of the opportunities open to them, and the company is more than repaid by the actual increase in the efficiency of its workmen, and by the assurance of unswerving loyalty for the men who have received all their training in its service. English is taught with special reference to writing business letters, filling out order blanks, time cards, and other details. The work is arranged to cover three scholastic years of forty-two weeks. Each appentice receives four hours of instruction a week, or a total of 504 hours for the three years. The subjects given include mathematics, physics, mechanical drawing, mechanics, mechanism, strength of materials, machine design, experimental tests and shop management. A monthly report is made by the head instructor and submitted to the general office of the company and to the Pennsylvania State College. These monthly reports, with the annual reports concerning each member of the classes, when taken in connection with the regular records of the shop foreman, form an accurate basis on which to select and use the men to the best advantage.

ATLANTIC TYPE CLASS E 6 LOCOMOTIVE; PENNSYLVANIA RAILROAD.

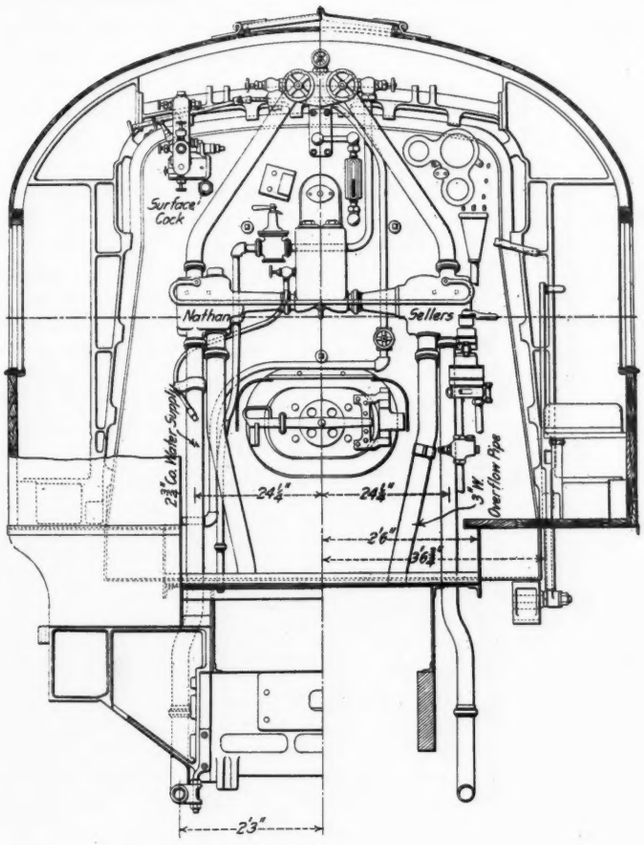
The large Atlantic type locomotive here illustrated was built at the Juniata shops of the Pennsylvania Railroad in December, 1910, and since that time has rendered very satisfactory service in hauling high speed trains on the Middle division of that road. Its best performance was shown by the making up of time on the schedule of the "Pennsylvania Special" from Harrisburg to Altoona with eight steel Pullman cars weighing 600 net tons. It is usually found necessary to double-head this train when it consists of more than six steel sleepers, even with locomotives weighing more than the new class E 6. A profile of this portion of the line with the schedule of the "Pennsylvania Special," or train 29, is shown on one of the illustrations.

On February 28, this locomotive broke all speed records between Altoona, Pa., and Philadelphia. The train consisted of two coaches and the private car of G. W. Creighton, general superintendent. It left Altoona at 8 a. m., and made the run to Harrisburg, 131.1 miles, in 112 minutes, or six minutes less than the best previous record. A large part of the run was made at a speed of more than 70 miles per hour. The run from Harrisburg to Philadelphia, 105 miles, was made in 97 minutes, of 5 minutes better than previous records. The train stopped only 3 minutes in Harrisburg.

The locomotive is remarkable for its large boiler and the great weight on drivers. With present track conditions, the limit for size, weight and hauling capacity of the Atlantic type loco-



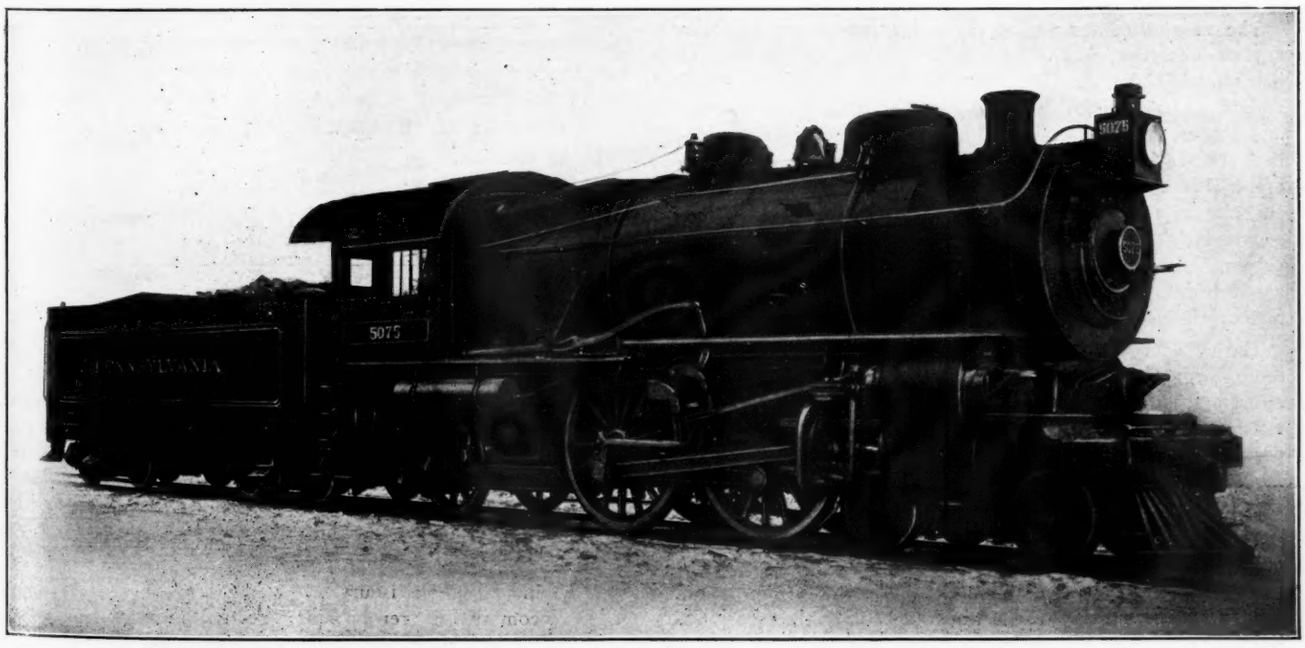
Cross-Section Through Firebox of Atlantic Type Locomotive.



Arrangement of Fittings in Cab; Atlantic Type Locomotive.

motive has apparently been reached in this design. With the introduction of the all-steel passenger equipment now used on all through New York trains on the Pennsylvania, it became necessary to provide high speed locomotives of an increased hauling capacity. The Atlantic type having previously been found satisfactory for high speed service, it was decided to ascertain what results could be obtained with a locomotive of that type somewhat heavier than those in use, the belief being that with no greater tractive effort than that of the previous standard Atlantic type locomotive the larger locomotive would increase the sustained hauling capacity at high speeds.

The general design follows closely that of other Atlantic type locomotives on the Pennsylvania, the principal difference being in the boiler, where increased heating surface was provided. To avoid the trouble experienced with long tubes, the



Class E-6 Atlantic Type Locomotive; Pennsylvania Railroad.

diameter of the boiler was increased so as to provide space for 460 2-in. tubes, 13 ft. 11⅝ in. long. The firebox has a combustion chamber of medium length and to avoid leaky joints in this chamber, the number of joints has been reduced to a minimum by flanging.

The boiler is 83½ in. in diameter outside at the dome sheet, and the two shell sheets are ⅞ in. thick. The dome is pressed from a sheet 1 in. thick and has a wide flange, which permits three rows of rivets. The combustion chamber has the tube sheet set 42 in. from the firebox sheet at the mud ring, and the gusset portion is flanged with a large radius. The water space between the parallel sheets at the bottom of the combustion chamber is 8 in. deep, and this, with the wide sweep of the sheets toward the mud ring, allows a free circulation of water to the side sheets. The Belpaire firebox is 72 in. wide and 110¼ in. long, with a grate area of 55.13 sq. ft. The water spaces around it are unusually large, the mud ring being 5 in. wide at the sides and the ends; the staybolts at the upper end of the firebox are 9 in. long between the sheets.

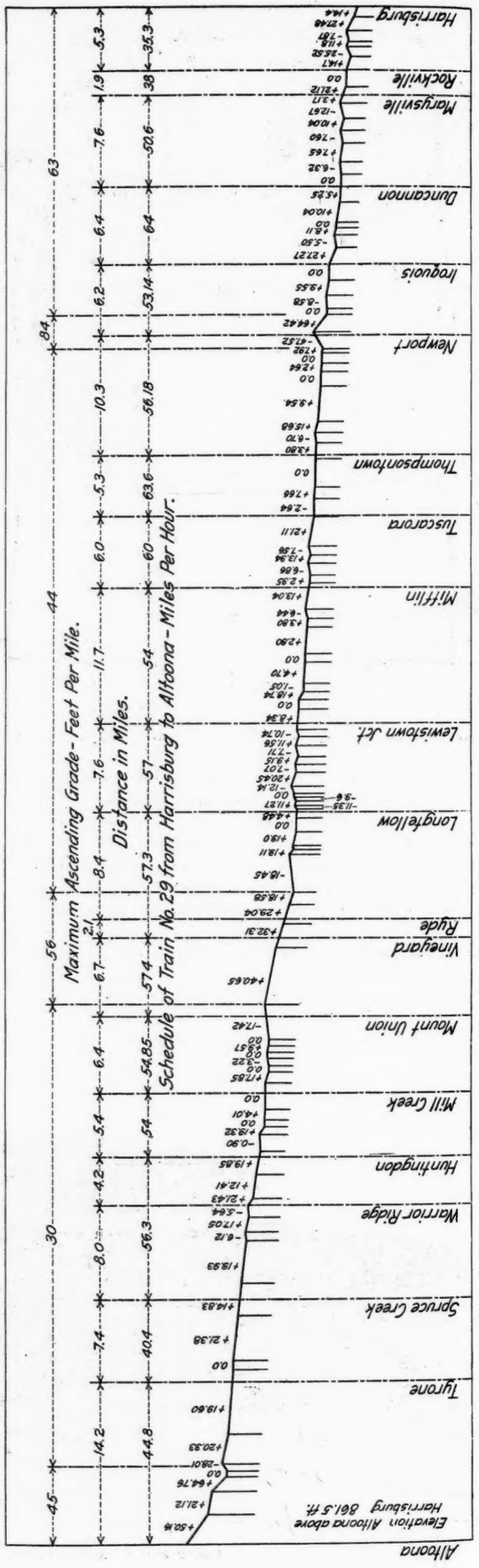
The boiler drawing shows the injector pipe carried through the boiler to within 30 in. of the front tube sheet and with an outlet at the boiler head. The drawing of the back head fixtures in the cab shows the arrangement of the injectors which lead into this feed pipe. There is one No. 11 Nathan injector on the left and a No. 11½ Sellers on the right. Water is supplied to these injectors through 2¾ in. pipes, and the overflow is conducted through 3 in. pipes. The injector steam pipes are led directly from the steam box on top of the boiler by short lines. The drawing also shows the cast iron front of the cab with the portions which fit against the sides of the firebox; also the cab ventilator, which consists of two shutters opening upward.

The ash pan, which is of the self-dumping type, is also shown in detail. The hinged bottoms are supported on heavy shafts extending along the outside of the ashpan, and these are connected by cranks and levers to the drop lever at the side. This type of ash pan has been used in large numbers by the Pennsylvania, and while meeting the requirements of the law has been found fairly satisfactory and comparatively free from the difficulties from warping and burning out which are usually found in most self-cleaning ash pans. It will be noticed that the connection of the lower portion to the upper part of the pan is provided with a large area of netting, so that the air supply to the grate cannot be restricted by dampers. The pan is made of ¼ in. tank steel and 2½ in. x 2½ in. wire netting.

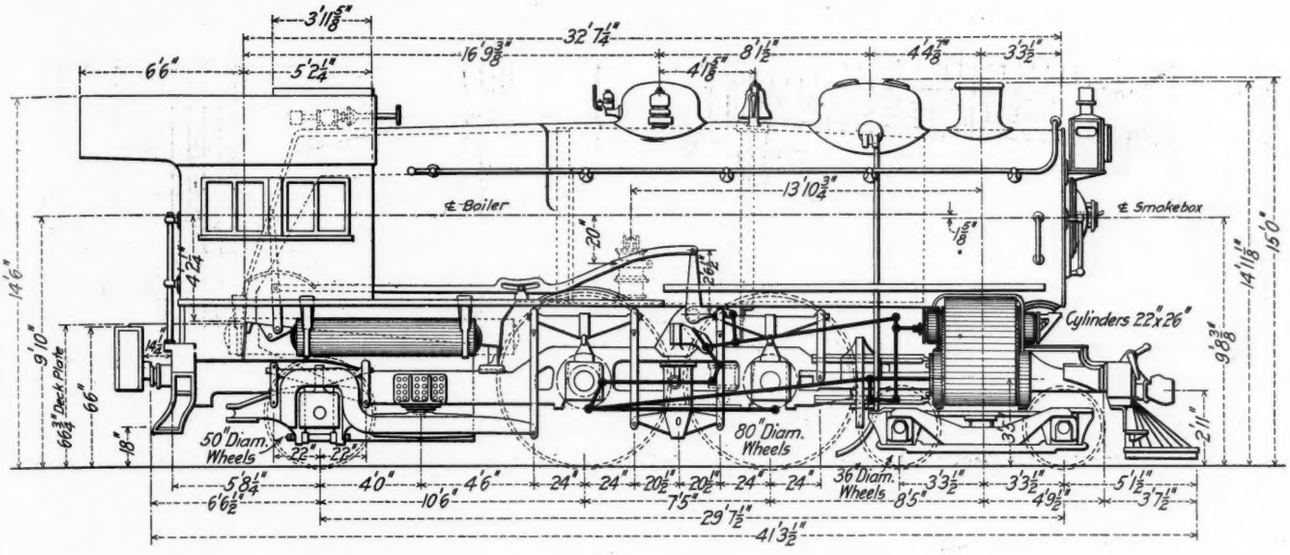
The weights of the engine ready for service are as follows: On engine truck, 51,270 lbs.; front drivers, 64,530 lbs.; main drivers, 68,770 lbs.; trailer trucks, 46,930 lbs.; total, 231,500 lbs.; weight of tender fully loaded, 158,000 lbs.; total locomotive and tender, 389,500 lbs. The total weight on drivers is 133,300 lbs., and we believe the weights on the individual driving axles are higher than those on any other locomotive in the world. In spite of this extreme weight on the rail and the load per square inch of journal, there have been no hot driving journals or pins, although the engine has made a large mileage on high speed trains; it is evident that it has been properly designed and carefully constructed.

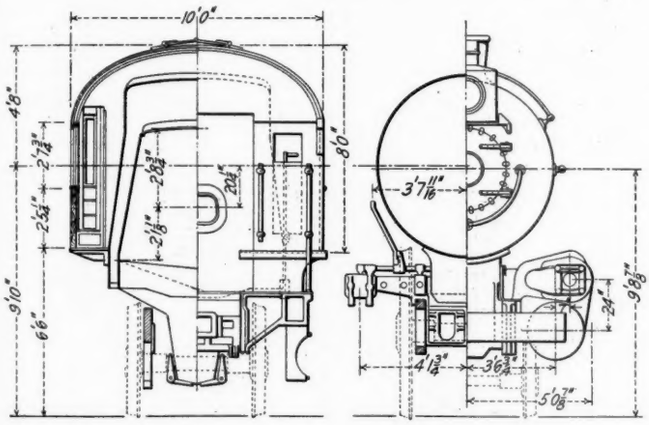
The cylinders are 22 in. x 26 in., and the driving wheels are 80 in. in diameter. The boiler pressure is 205 lbs. The tractive effort per pound of mean effective pressure is 157.3 lbs., and the maximum tractive effort with a mean effective pressure of 80 per cent. of the boiler pressure is 25,797 lbs. The total heating surface is 3,582 sq. ft., and the grate surface 55.13 sq. ft., the ratio of these being 65 to 1.

The valve gear is of the Walschaert type and has been worked out with unusual care. It is different from that usually supplied by the locomotive builders, especially in the size and weight of the moving parts which appear to be considerably lighter than those generally used on locomotives of this size in the United States. The careful provision for lubrication will



Profile of the Pennsylvania Railroad Between Altoona, Pa., and Harrisburg; also Schedule of the Pennsylvania Special.



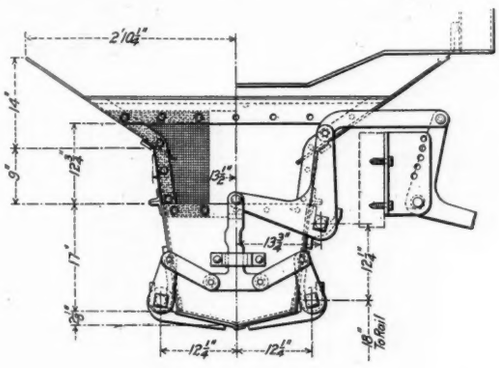


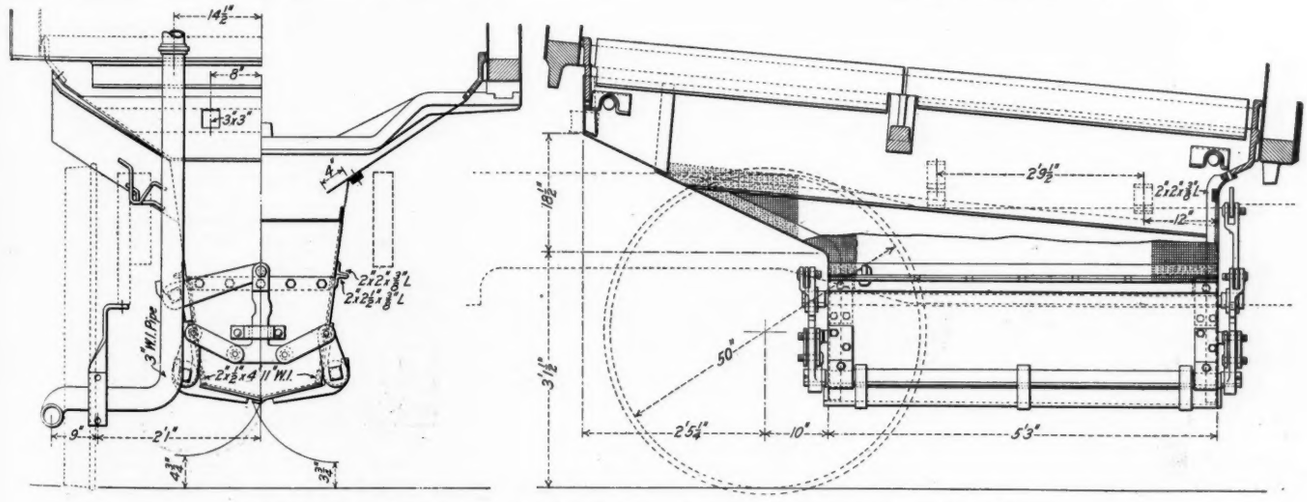
Heavy Atlantic Type Locomotive; Pennsylvania Railroad.

be noticed on the drawings; solid forged oil cups are used at nearly every pin connection in the valve motion.

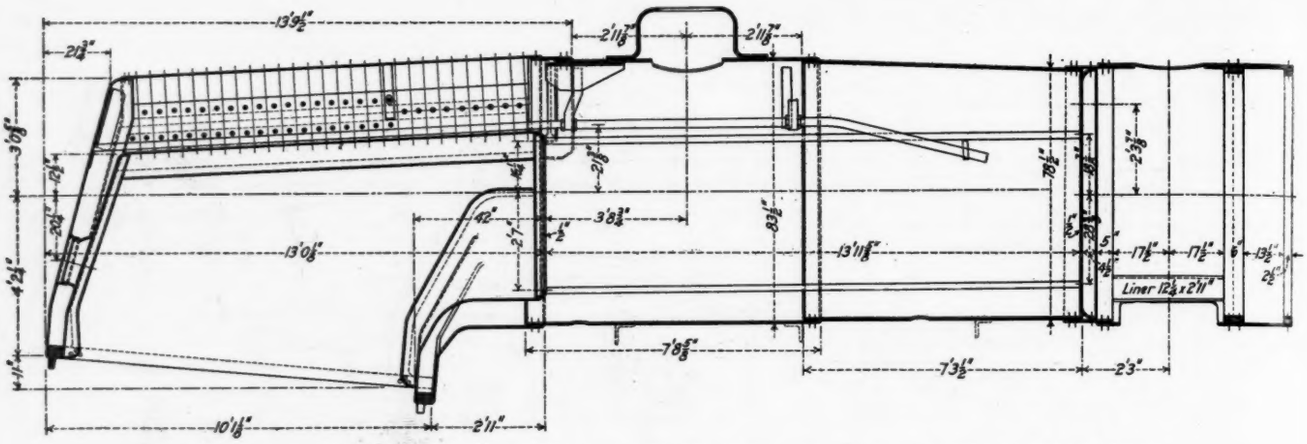
The trailing truck is one of the most difficult subjects for satisfactory design found in the Atlantic and Pacific types. The requirement for an outside journal box equalized with the inside driving box almost always produces an awkward construction. In the present design the large equalizers are very compact and are provided with a large ball bearing directly at the side of the joint in the back frames, the bearing bracket being secured by the same bolts which secure the two portions of the frame. The trailing truck is held in normal position by long helical springs which are placed in a pocket at the extreme rear end of the truck frame. Directly below this is a special brake cylinder for the brake shoes of this truck alone, and as the movement of the truck frame is normal to the truck wheels the brake shoes always have the proper position with respect to the wheel tread.

The main frames have slab sections, both front and rear, and while the bar portion is only 4 in. wide, it is increased to 7⅞ in. at the pedestals, making it unusually strong at these places and providing a wide bearing for the driving boxes. The design of the frame is adapted to either wrought iron or cast steel, but when cast steel is used not less than ¼ in. is allowed for finish, and most of the corners are rounded with ¼ in. radii.





Self-Cleaning Ash Pan for Atlantic Type Locomotive; Pennsylvania Railroad.



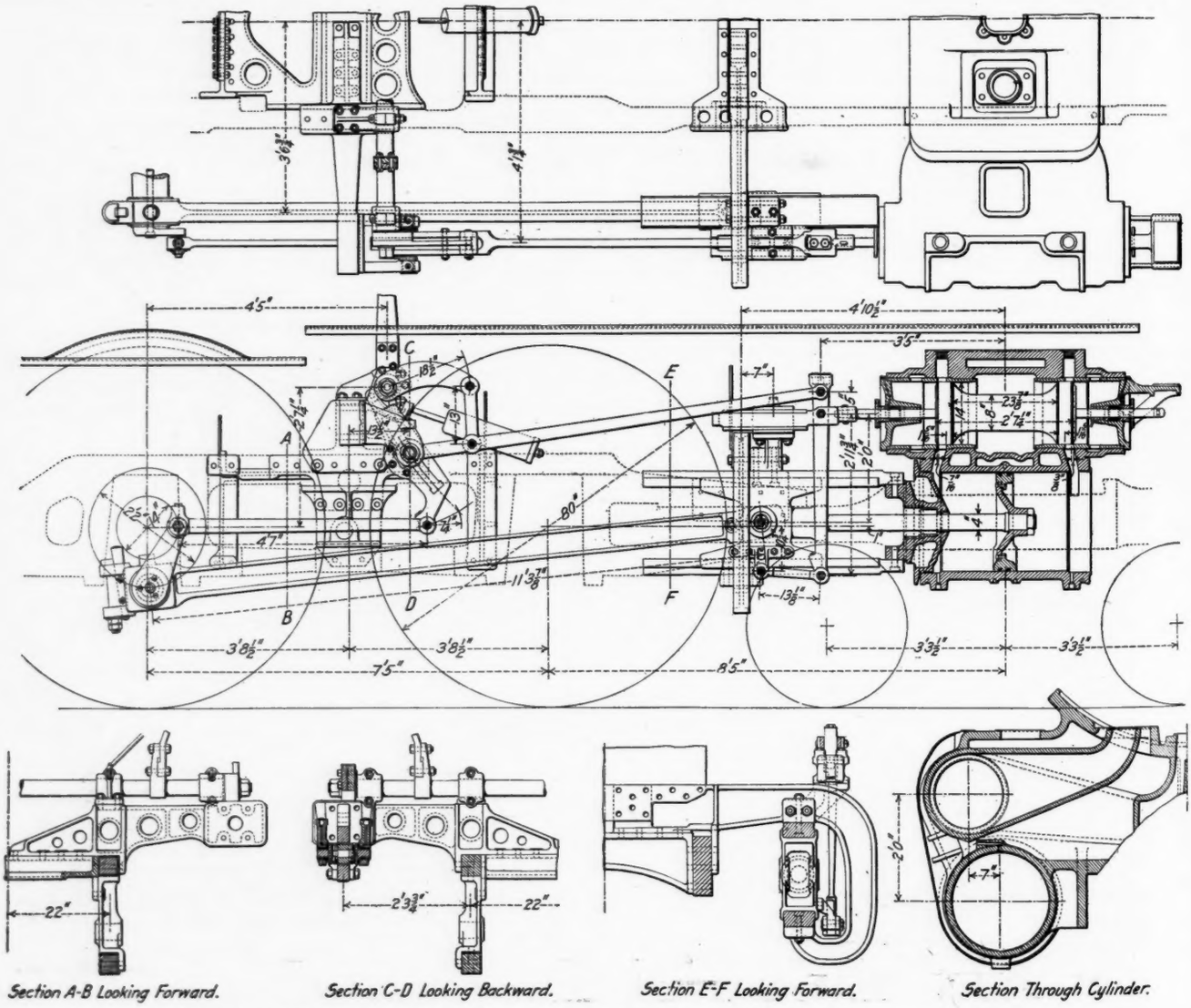
Longitudinal Section Through the Boiler of Atlantic Type Locomotive; Pennsylvania Railroad.

It will be noticed also that the corners of the wrought iron frames are chamfered in many places.

With the thoroughness characteristic of Pennsylvania Railroad methods, this new engine has been sent to the locomotive laboratory at Altoona for a series of tests to measure its performance and to determine on minor changes before any large number of locomotives of this class are built. The principal dimensions of the engine are given in the table below:

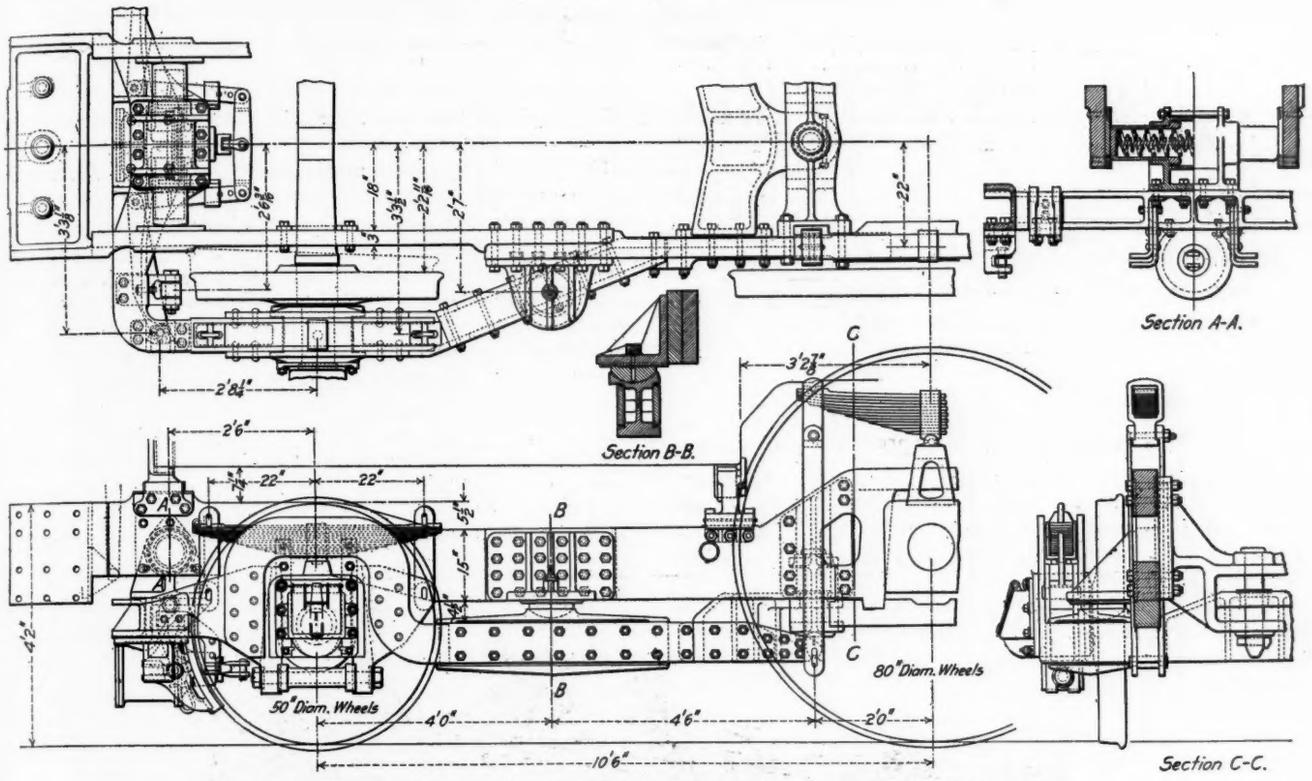
General Data.

Type	4-4-2
Service	Passenger
Fuel	Bituminous coal
Tractive effort	25,797 lbs.
Weight in working order	231,500 lbs.
Weight on drivers	133,300 lbs.
Weight on leading truck	51,270 lbs.
Weight on trailing truck	46,930 lbs.
Weight of engine and tender in working order	389,500 lbs.
Wheel base, driving	7 ft. 5 in.
Wheel base, total	29 ft. 7½ in.



Section A-B Looking Forward. *Section C-D Looking Backward.* *Section E-F Looking Forward.* *Section Through Cylinder.*

Walschaert Valve Gear as Used on Atlantic Type Locomotive; Pennsylvania Railroad.

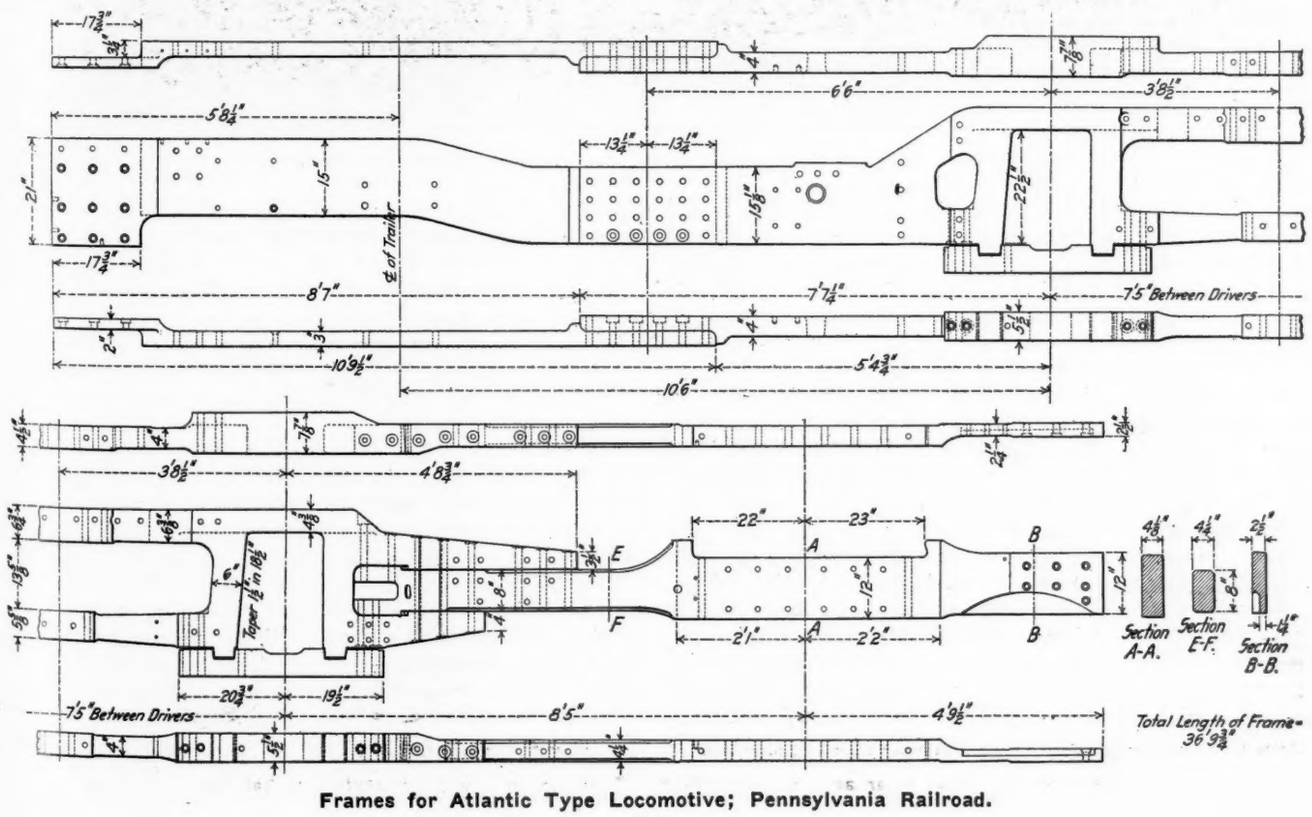


Trailer Truck for Atlantic Type Locomotive; Pennsylvania Railroad.

Cylinders.	
Kind	Simple
Diameter	22 in.
Stroke	26 in.

Ratios.	
Total weight ÷ tractive effort	8.97
Weight on drivers ÷ tractive effort	5.16
Tractive effort × diameter drivers ÷ heating surface	576
Total heating surface ÷ grate area	64.97
Firebox heating surface ÷ total heating surface, per cent.	6.08
Weight on drivers ÷ total heating surface	37.2
Total weight ÷ total heating surface	64.6
Volume both cylinders, cu. ft.	11.40
Total heating surface ÷ volume cylinders	314
Grate area ÷ volume cylinders	4.8

Wheels.	
Driving, diameter	80 in.
Driving, journals	9½ in. x 13 in.
Engine truck, diameter	36 in.
Engine truck, journals	5½ in. x 10 in.
Trailing truck, diameter	50 in.
Trailing truck, journals	6½ in. x 12 in.



Frames for Atlantic Type Locomotive; Pennsylvania Railroad.

Valves.

Type	14 in. Piston
Travel	7 in.
Lap	1 5/16 in.

Boiler.

Working pressure	205 lbs.
Firebox, width and length	72 in. x 110¼ in.
Tubes, number and diameter	460—2 in.
Tubes, length	13 ft. 11⅝ in.
Heating surface, tubes	3,364 sq. ft.
Heating surface, firebox	218 sq. ft.
Heating surface, total	3.582 sq. ft.
Grate area	55.13 sq. ft.
Center of boiler above rail	118 in.
Height from rail to top of dome	15 ft.

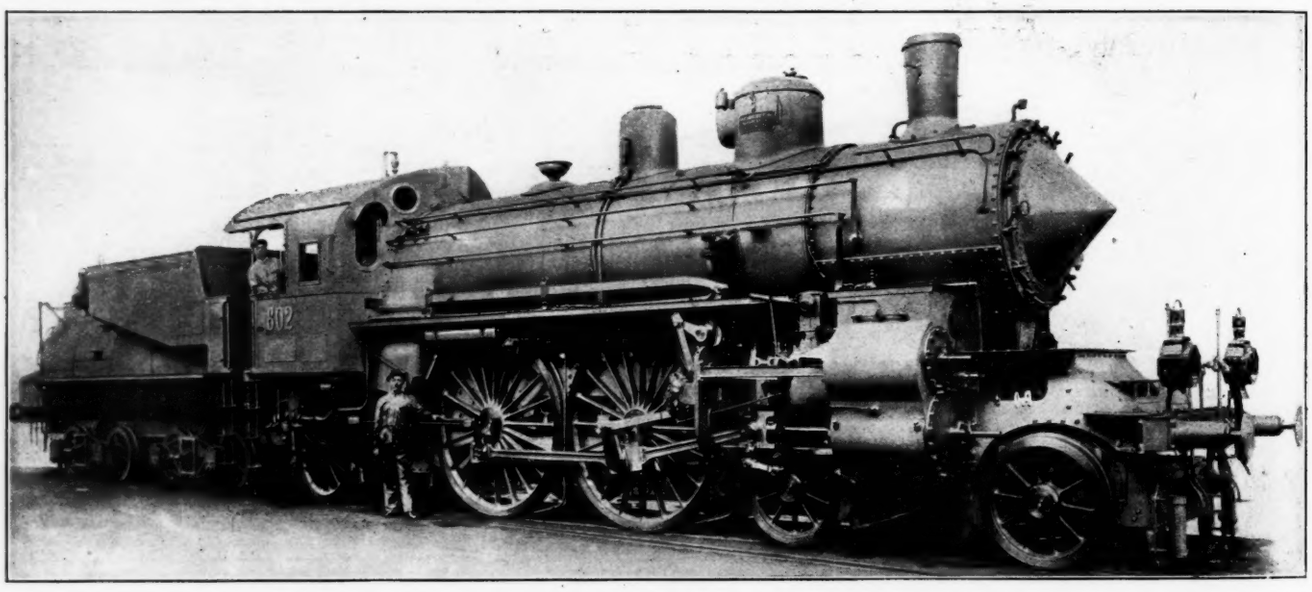
LOCOMOTIVE BUILDING IN EUROPE.

BY CAPTAIN GODFREY L. CARDEN, U.S.R.C.S.*

II.

FLORIDSDORF LOCOMOTIVE WORKS.

Locomotive building in Austria-Hungary is highly developed. There are no better locomotives in Europe than those turned out from the Floridsdorf Locomotive Works and the Budapest Locomotive Shops. The former plant is located on the outskirts of Vienna, and the latter in the city of Budapest. The Floridsdorf works have recently brought out a type of locomotive known as "Series 210." This locomotive is the design of Charles Gölsdorf, who is a member of the State Railways' staff, and is regarded as one of the leading authorities on locomotive design in Europe today.



Series "210" Locomotive; Built at the Floridsdorf Locomotive Works.

Series 210 is a superb machine. The total length of the boiler barrel is 4,280 (168½ in.) plus 1,450 millimeters (57 in.), the latter representing the length of superheating space. The length of the firebox is 2,700 millimeters (106 5/16 in.). The total heating surface is 292.4 sq. meters (3,147 sq. ft.) and the grate area is 4.62 sq. meters (49.73 sq. ft.). This locomotive is a four-cylinder machine with diameters for the high and low pressure cylinders of 390 (15⅜ in.) and 660 millimeters (26 in.) respectively, and a stroke of 728 millimeters (28⅝ in.). The driving wheels are of 2,140 millimeters (84 in.) in diameter, and the trailers and truck wheels are 1,034 millimeters (40¾ in.) in diameter. The fixed wheel base is 2,200 millimeters (85½ in.). The total wheel base is 10,450 millimeters (34 ft. 3 in.). The total weight in working order is 84.5 tons (186,200 lbs.). This engine is capable of hauling 440 tons on a 1 per cent. grade at a speed of over 60 kilometers (37.3 miles) per hour, and on a straight road 440 tons at a speed of 100 to 105 kilometers (62.1 to 65.2 miles) per hour. It develops about 1,800 h. p.

The Floridsdorf Works employ about 2,400 men. The shops actually cover about 21 acres, and about the same amount of adjoining land is occupied by homes and gardens of the workmen. It was at these works that the first 10-wheel freight engine was brought out for the Austrian State Railways. It was also designed by Charles Gölsdorf. A specialty of the Floridsdorf shops is rack railway locomotives, which include the Abt. type. The heaviest of these engines weighs about 163,000 lbs. in working order. Still another specialty is crane or industrial locomotives, which are specially designed for handling castings in steel works.

The machine tool installation at the Floridsdorf shops is a splendid one. A Cincinnati milling machine of the new vertical type (No. 4), which was probably the first one of its kind installed in Europe, was observed. This fact is mentioned to indicate the readiness of the Floridsdorf management to purchase the latest in shop equipment. Many American machines were at work, but the majority of the heavy tools were of Austrian origin. The firm of "Vulkan," located in Vienna, is supplying most of the heavy tools to Austrian machinery houses. There are a few small machine tool works in Austria, but their outputs are limited. German and American tools are imported to a large extent, especially of the medium sizes. For the year 1909, Germany exported more machine tools to Austria-Hungary than to any other country.

The Floridsdorf shops build, on an average, 120 locomotives per year. From an American viewpoint this is not a large number, but Floridsdorf is only one of the several locomotive plants in Austria-Hungary. There are no less than three locomotive plants in or near Vienna.

Many Sellers tools are in use in these shops. These machines were purchased direct from William Sellers & Co., of Philadelphia, Pa., and Director Hermann Gussenbauer of Floridsdorf, declared that he would buy more American machines if he could treat with the manufacturers at first hand, as with Sellers. This view is a general one regarding American machine tool sales in Europe. The Continental users of machines find that they must deal through foreign importers in order, in most cases, to secure American equipment. The general impression

*Captain Carden was detailed for two years in Europe as special agent for the Department of Commerce and Labor. His duties required him to report on the general machinery situation, especially with reference to machine tools. During this service he visited several hundred plants. The reports covering these visits are on file in the Bureau of Manufactures at Washington. Captain Carden's first article on Locomotive Building in Europe appeared in the *Railway Age Gazette* of March 3, 1911, page 399.

prevails that the prices charged for American tools by importers are greatly in excess of the standard American prices. According to the statements of many directors of foreign plants, they ask for nothing better when buying American machine tools than to be charged the prices asked in America plus the freight, insurance, and tariff.

There is much heavy milling work in the Floridsdorf shops, and here again it was noticed that European machine tool builders have furnished most of the tools. Reinecker of Chemnitz, Grafenstaden, and Collett & Engelhard—all German firms—are in evidence with heavy milling equipment. The Collett & Engelhard heavy millers are probably used more in European locomotive shops than any other one make.

Böhler tool-steel is used almost exclusively at Floridsdorf. All shaft bearings are treated under roller presses for the final finishing-off, or smoothing-up. Grafenstaden tools were doing all the milling work on boxes and connecting rods. A motor-driven Vulkan 3-frame slotting, boring, drilling and milling machine was in use. This tool was designed for working locomotive frames in sets and is capable of handling frames having maximum dimensions of 12 meters (39 ft. 4½ in.) long, 1,600 millimeters (63 in.) wide, and 350 millimeters (13¾ in.) high. It was sold to Floridsdorf for 60,000 crowns ($12,180).

Good machinists at Floridsdorf receive on an average 65 hellers (13.2 cents) per hour. A week's work is 54 hours, or 9 hours a day.

WIERNER-NEUSTADT LOCOMOTIVE WORKS.

The Wierner-Neustadt Locomotive Works are in the outskirts of Wierner-Neustadt, a city of 28,000 inhabitants, and distant about 1 hour by fast train from Vienna. It lies to the south of Vienna. Ordinarily, the force employed in the Wierner-Neustadt shops approximates 2,200. Locomotive output is about the same as at Floridsdorf, or 120 locomotives per year. An examination of the equipment record indicates that these shops have not undertaken to build as heavy and powerful engines as are built at Floridsdorf. The statement was made that 1,200 h. p. represented the heaviest locomotives, in point of power, so far built. All locomotive work at Wierner-Neustadt is of the plate-frame type. The plate frames are cut out by oxygen-gas after the manner followed at Borsig.

Not a few American machine tools are in service here, but there are many old foreign tools which might well be replaced. The policy of the new management is to replace these old tools as rapidly as possible with up-to-date ones. The boiler shops are the most modern of the various departments. There is a Vulkan machine in use on boiler work for drilling plates 15 meters (49 ft. 3 in.) long. There is also a special 5-spindle machine made by the locomotive builder, J. A. Maffei of Munich. Among the American tools in use were those of the following houses: Prentice Bros. Company, Worcester, Mass.; Bullard Machine Tool Company, Bridgeport, Conn.; Bement, Miles & Co., Philadelphia, Pa.; American Tool Works Company; S. A. Gray Company, Lodge & Shipley, and the Bickford Machine Tool Company, all of Cincinnati, Ohio, and Gisholt, of Madison, Wis.

The power for the shops is supplied by two Parsons' turbines representing about 1,600 h. p. There are tools in the Wierner-Neustadt shops that have been in service for 40 years. One machinist stated that he had been working steadily at the same machine for 28 years. This was a Sigl (Austrian) lathe for turning crank shafts. This man received between 8 and 9 kronen per day (1 krone = 20.3 cents).

A day's work at Wierner-Neustadt is 9½ hours. Work commences at 7 a. m. and stops at 6 p. m., with an interval of 1½ hours at midday. On Saturdays the shops close at 5 p. m. The men are paid on the basis of a fixed valuation for the work assigned. If the work is not completed by the week end, the workmen are paid advances on the final price. The better class of machinists at Wierner-Neustadt receive sums varying from 8 to 9 kronen ($1.62 to $1.83) per day. In a few instances as high as 12 kronen ($2.44) are earned per day.

STATE RAILWAY LOCOMOTIVE WORKS.

The State Railway Locomotive Works is located in the city of Vienna, and is one of the oldest locomotive shops in Austria. It was here that the old locomotive "Philadelphia" served as a prototype in the early history of Austrian locomotive building. These are the shops which were developed by the Scotchman, John Haswell, and to him the credit is given for the impetus early imparted to locomotive building in Austria.

The general design of the locomotives built at the State Railway Works follow the ideas of Charles Gölsdorf. In addition, these works build both Atlantic and Prairie type locomotives. The finished machines are marked examples of care and painstaking efforts. Here, as in the case of Floridsdorf, Austrian machine tools are much in evidence for the heavier class of work. Collett & Engelhard have supplied a four-spindle drill for boilerhead work, and Vulkan has built a tool for milling the edges of boiler shells. There was one heavy slotter in service, the make of Fairbairn, Naylor & Co., which was working up to 12 layers of locomotive frames, each of 30 millimeters (1.18 in.) thickness. One Austrian miller (Dania) was milling the sides of connecting rods, the steel in the rods having a tensile strength of 70 kilos per square millimeter (99,563 lbs. per. sq. in.). Many Sellers' tools are in use, which were purchased direct from the Philadelphia house. There was one Sellers' boring mill at work (No. 276), which was referred to by an official as truly a mystery, never having required any repairs. He added that he knew none better. A Sellers' cylinder borer (No. 731) came in for much praise. The same official declared that he could finish up all boring work on one locomotive cylinder in 8 hours' time with the Sellers' tool. This includes, he said, face cutting, reaming and boring. Attention was called to a Sellers' planer (No. 1,057), planing off locomotive cylinder bearings. This Sellers' tool was equipped with Sellers' patent spiral gear, having six return speeds and a single belt. The shop's director declared that he regarded the working of this Sellers' planer as little short of wonderful. Other American machine tools in service were from the following houses: Gisholt; Gould & Eberhardt; Hilles & Jones; Brown & Sharpe; G. A. Gray & Co., and Pratt & Whitney.

BUDAPEST LOCOMOTIVE WORKS.

The Budapest Locomotive Works, essentially a state railway's organization, is owned by the Hungarian state and controlled by the Ministry of Finance. It may properly be referred to as the Machinery Works of the Royal Hungarian State Railways. The number of men employed approximates 4,200, and the machine tool installation comprises 2,000 machines of a great variety of designs and makes. The most exacting work is done at these shops in the building of not only locomotives, but gas engines, engines for motor cars and locomobiles. In the entire lot of 2,000 machine tools, the writer was able to observe only 16 machines of American origin. It was apparent that this fine plant had been overlooked by the makers of American machine tools. Why this should be is inexplicable. There is undoubtedly a strong pro-American sentiment in Hungary, and American machine tools should find a ready market in that territory.

It is the writer's opinion that the Budapest Locomotive Works are turning out several types of locomotives more nearly approaching American standards than will be found, probably, in any other European shops. This statement is made after personal visits to the leading locomotive plants of Germany, Switzerland, Belgium and Austria. It may be said further that the Prairie and Atlantic type locomotives built at Budapest are unexcelled on the continent. These are complete American locomotives, but in a highly finished garb. Imagine one of our standard size Prairie type locomotives, equipped with copper fireboxes and copper staybolts, the valve gear of the highest efficiency, with a machine finish on all engine parts fit for an

exposition display, and one has a picture of every Prairie type locomotive turned out at Budapest. These Hungarian locomotives are designed and built to last 20 years and more.

It is not to be taken for granted that the high finish on these locomotives is a part of the builder's scheme. The state designs call for this elaborate attention, and as the work is under state inspection there is no gainsaying or going behind the specifications. Several of the Budapest locomotive officials have advocated that copper fireboxes and copper staybolts be done away with, and that the American type of steel firebox be substituted, thereby saving much expense. It is said that the question has been discussed unofficially with the state railways authorities, and with a view to taking action in the event of the price of copper advancing materially.

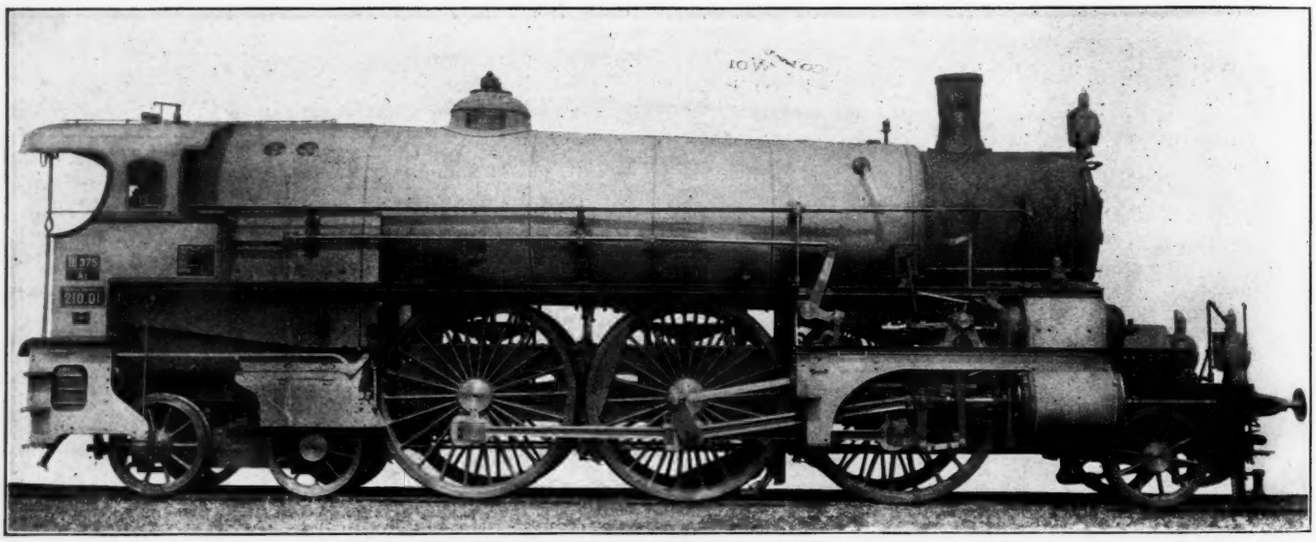
Attention has been previously directed to the exacting demands of the European locomotive market, due to the fact that the standards are largely fixed by the designs emanating from government sources. The government-issued designs have a marked influence on locomotive building and largely affect the private orders; that is to say, the private orders are apt to specify elements and demand exactions called for by the State Railways engineers. The pace has apparently been set in Europe which admits of competition only on the part of engines of the highest design and finish, and for these reasons American locomotives of everyday knock-about type are apt to compare unfavorably when judged in the light of finish and form. This does not imply that our own builders cannot reach European requirements. We have doubtless not thought it worth while, due perhaps to the extraordinary demands in the home market. The distinction between the European and the American locomotive is largely one of environment and accompanying shop conditions, for most assuredly the requirements of the foreign and the home market are not the same.

There can be little doubt, based on actual knowledge of shop conditions abroad, that European locomotives can be built cheaper and quicker in the United States than in Europe, notwithstanding the difference in wages. The advanced shop efficiency so apparent in many of our works over the average European shop makes this result possible. It is largely a question of seeing fit to assign to some one shop the building, exclusively, of the European type of locomotive. The desired result can hardly be secured if it is attempted to build the European locomotive in a shop where standard American engines are being turned out. The job is a specializing one, and calls for gangs trained to the particular line of work in hand, and always with the one object in view, namely, to meet the foreign requirements. That can best be done by building the European locomotive *per se*.

There are many English tools in these works from the firm of Alfred Herbert, of Coventry. The Herbert firm has induced the locomotive works management to send five of the leading workmen to Coventry for the purpose of familiarizing the men with the various Herbert tools, and arrangements exist whereby an inspector from Coventry goes to Budapest at varied intervals and personally advises relative to the running of the machines.

There is probably no field in Europe today which lends itself more readily to the purchase of American tools than Hungary. The sentiment is favorable to American advances, and it is the fault of the manufacturers of the United States if they do not take advantage of the situation. The Hungarians frequently ask why it is that Americans do not come to them in person.

The Budapest output for 1909 was, it is understood, 208 locomotives. These works are building four-cylinder compound engines designed for working pressures of 16 atmospheres (235 lbs.). Schmidt superheaters are employed whenever the designs call for superheaters. The valve gear is of the Hensinger type, modified for a four-cylinder engine. The practice



High Speed Locomotive, Type In, Built by the Budapest Locomotive Works.

is followed of casting in one piece the pair of cylinders required for a compound engine, and then boring out the two cylinders simultaneously. In the boiler shop a special type boiler head drilling tool, manufactured by Maffei of Munich, was observed.

The State Railways credit the Locomotive Works with 1.8 crowns per kilo (16.6 cents per lb.) on all new locomotive construction. The gage of the Hungarian railways is 1.435 meters (4 ft. 8½ in.). The Prairie type locomotive, as built by the Budapest shop, has nearly reached the limit of height permissible on the Hungarian railways, and whatever further increase is found possible must necessarily be slight.

The principal features of the high-speed locomotive, type In, are as follows:

General Data.

Gage	4 ft. 8½ in.
Length	42 ft. 5 in.
Width	10 ft. 2 in.
Height	15 ft. 0 in.
Wheel base, engine truck	8 ft. 0 in.
Wheel base, rear truck wheel to driver	6 ft. 1 in.
Wheel base, driving	7 ft. 3 in.
Wheel base, rear driver to trailer	10 ft. 10 in.
Wheel base, total	32 ft. 2 in.
Weight in working order	164,000 lbs.
Maximum tractive effort	17,204 lbs.

Cylinders.

Diameter of high and low pressure cylinders	14 3/16 in. and 24⅜ in.
Piston stroke	26 in.

Wheels.	
Driving, diameter	82¾ in.
Engine truck, diameter	41 in.
Trailer truck, diameter	48 in.
Boiler.	
Working pressure	227 lbs.
Length of boiler	31 ft. 2 in.
Diameter of boiler	63 in.
Tubes, number	291
Length of tubes over tube sheets	17 ft. 2½ in.
Diameter of tubes outside	2 1/16 in.
Heating surface, tubes	2,687 sq. ft.
Heating surface, firebox	139 sq. ft.
Heating surface, total	2,826 sq. ft.
Grate surface	42 sq. ft.
Tender.	
Water capacity	4,750 gals.
Coal capacity	8 tons
Diameter of wheels	34½ in.
Wheel base	16 ft. 7 in.

GANZ WORKS.

The Ganz Electrical Works are located in Budapest. It was Ganz who brought out the electric locomotives for the Italian railways, which were later loaned for service in the Simplon tunnel. These Ganz electric locomotives have a total rated output of 2,000 to 2,800 effective horse-power. According to Ganz they would give a maximum draw bar-pull of 42 tons, a rating which is regarded as theoretical, as the adhesive weight is not sufficient for hauling more than the 9 to 10 tons under favorable conditions. Ganz early installed the three-phase current system for heavy traction on main railway lines. The first railway on which three-phase traction was employed is known as the Valtellina line, in the north of Italy. The electrical equipment for this road was built in 1902, and consisted of 10 motor cars, each supplied with four 250-h. p. motors, and nine locomotives. Five of these locomotives were of the power above mentioned, and three of them were assigned for some time to duty at the Simplon tunnel.

FOREIGN RAILWAY NOTES.

An important section, from Rayado to Papudo, of the Longitudinal Railway, Chile, has been opened to traffic.

A survey is now in hand for a proposed 150-mile railway from Tzaneen to Messina in the Zoutpansberg district, South Africa, primarily to serve the Messina and adjacent copper mines and to afford a short and direct line between the northeastern part of the Transvaal and Rhodesia. It will also materially assist in developing the agricultural and mineral resources of the area between the Zoutpansburg range and the Limpopo river.

An underground railway has been built in Munich, Germany, solely to carry mails from the main station to the post-office. The tunnel has a rectangular section 7 ft. 9 in. wide and 5 ft. 11 in. high, with a troughlike depression in the center for employees to walk in, and a narrow gage railway on either side. It is 1,148 ft. long. Part of the line is below water level, and the whole structure is water-tight. The little trains are run by electricity.

It is argued in favor of a railway extending from the Asiatic midland in Ferghana northeastward to a connection with the Siberian Railway, that it would enable the province north of Ferghana to supply Ferghana with grain, and enable the latter to devote most of its land to cotton, which is already produced there in considerable quantities. In Ferghana wheat costs more than a dollar a bushel; in the province north, perhaps 300 miles distant, 17 cents.

By a decree of recent date, the government of Brazil grants to the Sao Paulo-Goyaz Railway Company or to a company which it may organize, the right to build 75 miles of railway line from Monte Azul, in the municipal district of Bebedouro, state of Sao Paulo, to the banks of the Rio Grande, which divides this state from Minas Geraes. The line will benefit especially the colonies Cresciuma, Portao do Ceo, and Corrego Rico. The company will receive a subsidy of about $8,000 for each mile of line built.

Shop Kinks.

The following shop kinks are among those that were submitted in the competition which closed January 15. Three of the 18 collections which were entered in that competition, including the first and second prize collections, were published in our issue of February 3. Five collections were reproduced in the issue of March 3.

SIOUX CITY SHOPS; CHICAGO, ST. PAUL, MINNEAPOLIS & OMAHA.

BY T. E. FREEMAN.

General Foreman, Sioux City, Iowa.

Credit also due to A. G. Wright, Master Mechanic; J. L. Riley, Machine Foreman; and M. J. Tiernay, Blacksmith Foreman.

AIR HOIST FOR CAR WHEEL BORING MILL.

A hoist for handling car wheels to and from a boring mill is shown in Fig. 79. The hand crane attached to the boring mill bed has been displaced by an air hoist of rather novel design. The cylinder, which is 5 in. in diameter and has an 18-in. piston stroke, is mounted directly on the crane arm and swings with it. The overhang of the crane arm is 4 ft. The air cylinder is supported by the wrought iron braces.

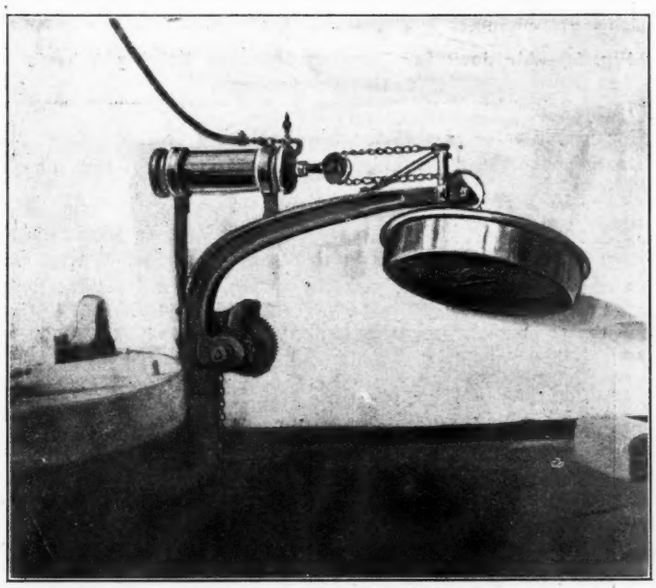


Fig. 79—Air Hoist for Car Wheel Boring Mill.

TIRE WAGON.

A simple tire carrying wagon is partially shown in Fig. 81. The wagon is pushed over the tire, straddling it, and the handle is elevated, thus lowering the upright and allowing a pin to be passed through the two parts of the upright and below the inner side of the tire. By lowering the handle the tire is raised a short distance above the floor. The wheels of the wagon are 56 in. in diameter. The upright is constructed of 4 by 1 in. iron; the handle bars are 3 in. by ¾ in., and are forged round at the outer ends as shown. The uprights are braced to the handle bars by the ¾ in. iron rods.

AIR JACK FOR TURNING MOUNTED DRIVING WHEELS AT TRACK INTERSECTIONS.

An air jack for raising and turning mounted driving wheels at track intersection is shown in Fig. 80. It is simple and inexpensive. The top section of the ram and the fork on which the axle rests may be removed when the jack is not in use, so as not to obstruct the floor or track. The air cylinder has an

inside diameter of 14 in. The stroke of the piston is 16 in., although the admission of air to the cylinder may be regulated

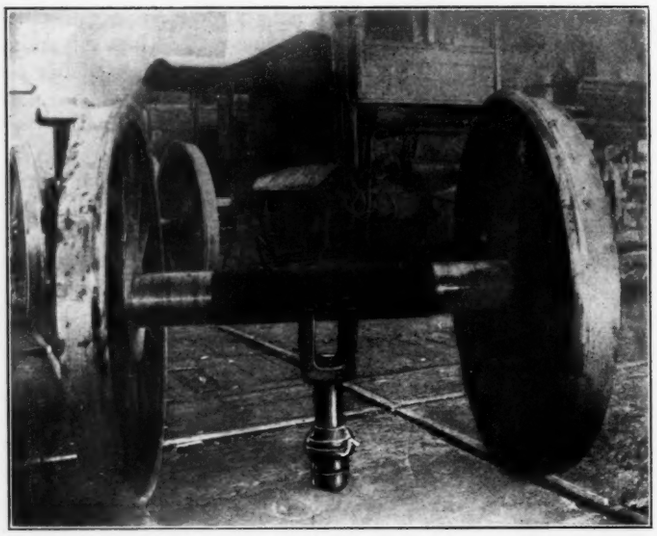


Fig. 80—Air Jack for Turning Mounted Driving Wheels at Track Intersections.

by the air valve so that the wheels are only lifted a short distance above the floor. The piston rod is made of 5-in. pipe.

PORTABLE AIR JACK.

A portable air jack is shown in Fig. 83. It is supported on two pairs of wheels through two springs, in such a way that when no load is on the jack the springs lift it from the floor,

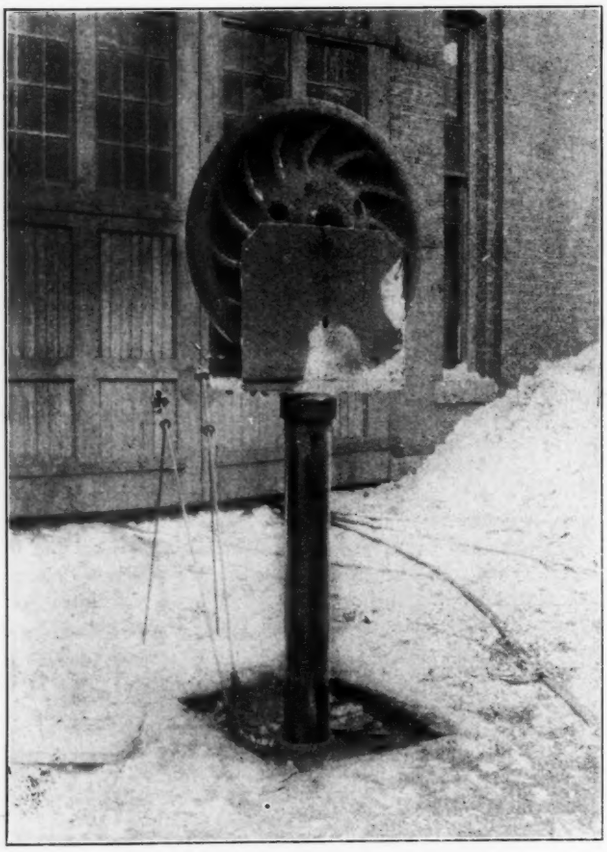


Fig. 82—Jack for Loading Car Wheels.

making it portable. When the load is applied the springs compress, allowing the jack to rest on the floor. The advantage of this provision is apparent. The cylinder is 14 in. in diameter and the piston has a 16-in. stroke. The springs are 2 in. in diameter and 8 in. high and are made of ¼-in. steel.

JACK FOR LOADING CAR WHEELS.

A novel method of loading and unloading car wheels to and from flat cars is shown in Fig. 82. The cylinder of the

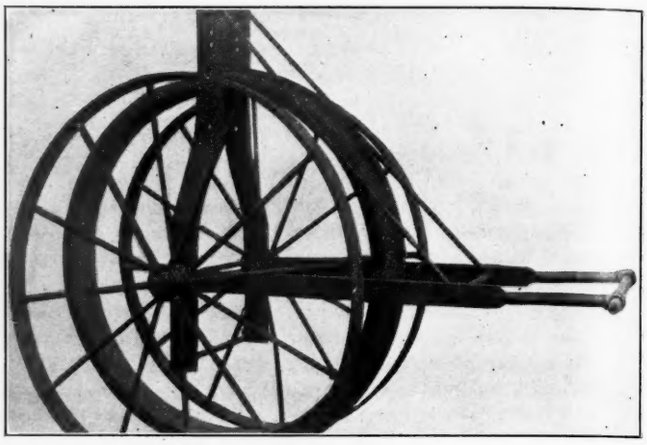


Fig. 81—Driving Wheel Tire Wagon.

air jack has an inside diameter of 8 in., and the piston a stroke of 5 ft., or sufficient to raise the wheel to the level of the floor of a flat car. The wheel is kept in an upright position by the two

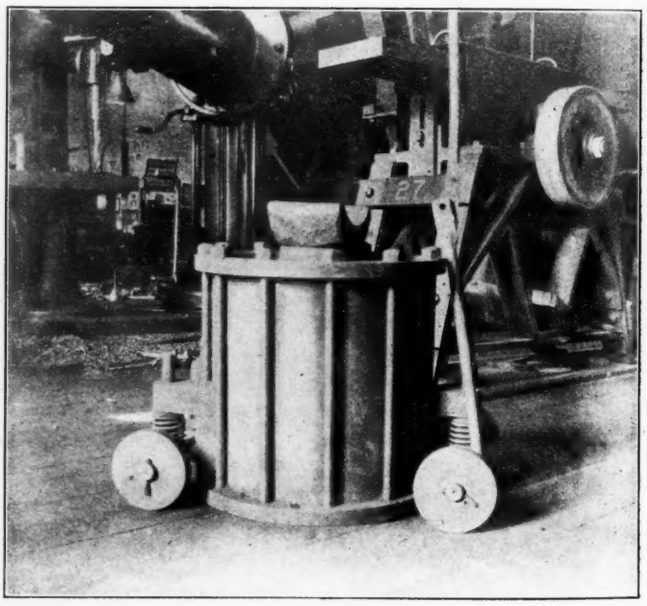


Fig. 83—Portable Air Jack.

pieces of 3/16 in. boiler plate through which a bolt is placed, as shown, to prevent the wheel from rolling off endwise. The piston rod is made of 5-in. pipe. The cylinder is set in a bed of concrete.

GARRETT SHOPS; BALTIMORE & OHIO.

BY JOHN V. LE COMPTE.
Foreman, Garrett, Ind.

LUBRICATING HOLES IN HUB LINERS OF DRIVING BOXES.

It is generally accepted as necessary that the hub bearings of driving boxes should be lubricated. Holes are drilled in the box casting from the oil cavity to the bearing, but to maintain these holes after a new bearing has been cast on, although it seems a simple proposition, is really a difficult task, for with

the hole covered with the liner and plugged up with the brass the machinist has no means of locating exactly where it should be, and when he attempts to drill it the chances are that he will hit the hole in the casting a little off the center, which usually breaks the drill. This operation of drilling through the liner and redrilling the holes in the box requires, on the average, about one hour. A device shown in Fig. 84 has been provided to do away with this difficulty. After the old brass has been stripped off and the box is ready for its new bearing, a small piece of round iron about 5/16 in. diameter

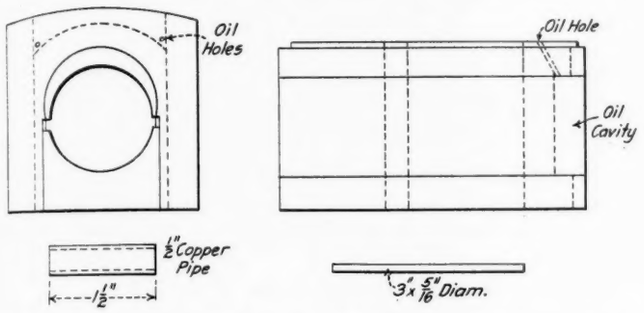


Fig. 84—Device for Preserving Lubricating Holes When Pouring New Hub Liners on Driving Boxes.

and 3 in. long is placed in the holes previously drilled in the box, and over these pieces are placed ⅜-in. copper pipes, about 1½ in. long, resting squarely against the face of the box. The brass liner may then be poured on and when it has cooled the round iron may be withdrawn, leaving the lubricating holes clear. Care must be taken when pouring the brass to make sure that the copper pipe is of sufficient length so that the brass will not pour over the top, thereby preventing the removing of the round iron. This device costs about one cent per box and save about 25 cents per box when the cost of broken drills is considered.

ADJUSTABLE CHUCK FOR HORIZONTAL BORING MILL.

In boring oil cellars, grease lubricators, trailer cellars, bearings, etc., in a horizontal boring mill, the wrought iron chuck shown in Fig. 85 has proved valuable in the saving of both time and labor. Two of these chucks are adjusted suitable to the length of the work to be bored, and are clamped to the table of the machine with bolts in the holes provided for that purpose. The tongue in the bottom of the chuck fits snugly in the slot of the table, thus holding the two chucks parallel to

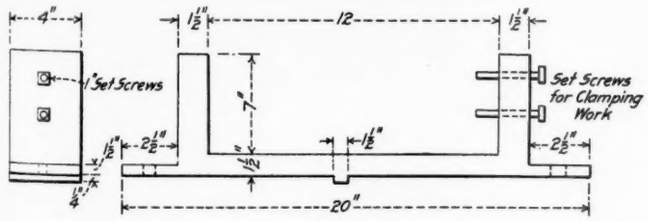


Fig. 85—Adjustable Chuck for Horizontal Boring Mill.

each other. The work is clamped in the chuck by the set screws, which are set at an angle, so as to hold the work securely in place. After once adjusting the chuck and the table for a given job, any number of similar pieces may be adjusted by simply loosening and tightening the set screws in the chuck as the pieces are removed and replaced.

OIL GROOVES IN DRIVING BOX SHOE AND WEDGE FACES.

The usual method of chipping oil grooves in driving box shoe and wedge faces with a pneumatic hammer takes considerable time and makes unsatisfactory grooves. By the method illustrated much better grooves are made in a shorter time. The tool shown in Fig. 86 is applied to a drill press and is made so that a small drill may be placed in the pocket in the center of the bar and be adjusted to project the proper distance. It is clamped in this position by a set screw. This drills a hole and holds the bar rigidly in place, while the grooving tool, after being adjusted to the desired radius and clamped in place by the

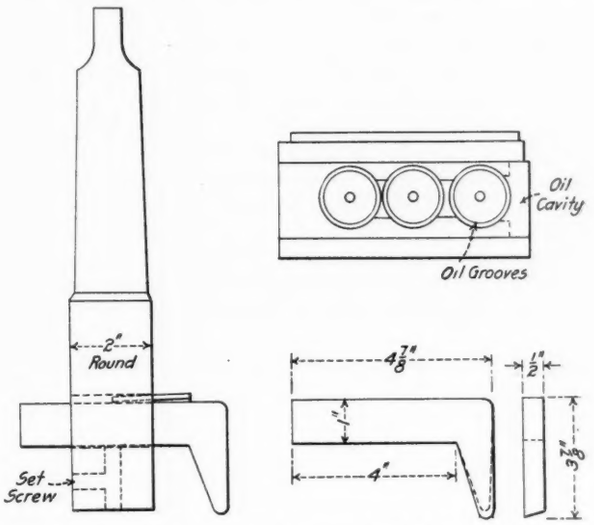


Fig. 86—Tool for Making Oil Grooves in Driving Box Shoe and Wedge Faces.

taper key, makes the oil groove. Grooves may thus be made in 40 per cent. less time than if the center hole and groove were made in two operations, and in 75 per cent. less time than required for chipping with a pneumatic hammer.

CYLINDER AND VALVE PACKING RINGS.

We make cylinder packing rings with the tools shown in Fig. 87 in the following manner: A vertical boring mill with two heads on the cross rail is used, and is operated at a cutting speed of about 30 ft. per minute. The left head is used for the roughing cut at a feed of ⅛ in. per revolution, and then for a finishing cut at a speed of ⅜ to ½ in. per revolution. The right head is used for cutting the rings to the desired width

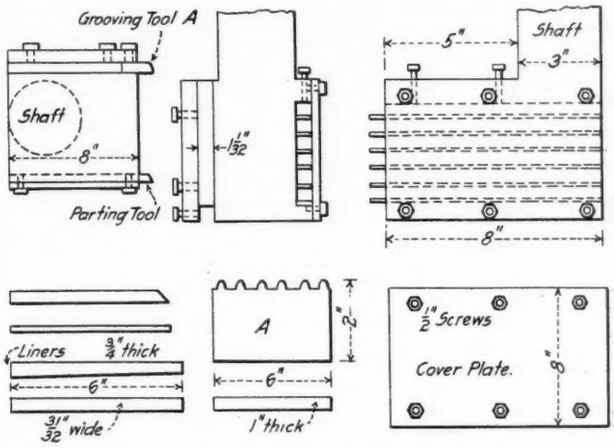


Fig. 87—Tools for Making Cylinder Packing Rings.

with the special tool shown in the upper right hand corner of the drawing. It is made up of six ¼ in. x 1 in. high speed steel tools, separated from each other by strips of steel, whose width is the width of the rings, plus the thickness of tissue paper, this extra thickness being allowed for finish, which is accomplished by slightly raising and lowering the head with the parting tool after it has cut to the proper depth. The pocket in the tool, which contains the six tools, should be 1/32

in. less in depth than the thickness of the tools, so that the cover plate when placed over the tools will hold them firmly. The set screws at the top of the head also clamp the tools and spacing strips firmly in place. After the first six rings are finished, if it is desired to groove them so that the bearing on the cylinder walls may be reduced, another tool, A, should be inserted in the other side of the head. Very little time is thus required for separating and finishing the rings, for while the left hand head is roughing and finishing the outside of the casting, the right hand head is separating and grooving the rings. In boring off these rings it is not necessary to raise the head to remove each ring separately, as they will ride in place and time is saved by taking them off four or six at a time. With this device we have been able to reduce the cost per ring 33 per cent. Forty-five rings from 20 in. to 22 in. in diameter are finished in 10 hours. That part of the tool, or head, which holds the grooving tool may be used for a variety of other purposes, often making it possible to do odd jobs on the machine without removing the tool from the head.

ATLANTIC CITY ENGINE HOUSE; WEST JERSEY & SEASHORE.

BY CHARLES MAIER.
Engine House Foreman, Atlantic City, N. J.

SPONGING TRACK AND PIT.

An arrangement for sponging journal boxes and removing brasses is shown in Fig. 88. The track is equipped with air jacks in a pit and the necessary tools and blocking are kept in a tool chest near by. Two air cylinders are used for removing tender truck brasses and two for removing trailer and engine truck brasses. These cylinders are 14 in. in diameter and have a 12 in. lift, using air pressure from 100 to 135 lbs. per sq. in. Two chains are provided with each pair of cylinders, which go under an iron bar, that passes under both rails, and over the axle, holding the wheel to the rail while the journal box is raised to remove the bearing. Two water valves are located on each side of the pit to which a hose is attached for cooling off hot journals. The cylinders are piped together, but are so arranged that they may be used independently if desired; the piping may be connected either

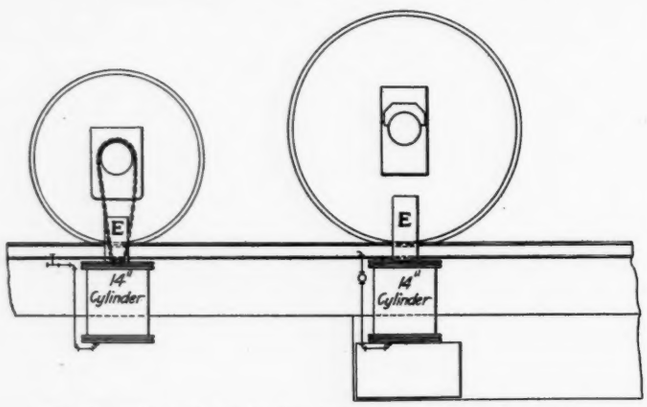


Fig. 88—Pits and Jacks for Removing Journal Bearings.

to the shop air line or to the train line hose back of the tank. The plungers of the cylinders are provided with removable pieces E, which fit between the top of the cylinder and the under side of the journal boxes.

LOCKING NUTS ON BOLTS.

A good scheme for locking nuts on bolts is shown in Fig. 89. All nuts are drilled in jigs so that the outside edge of the hole will just cut to the bottom of the thread. The nut is then screwed on the bolt, and after it is tight, or is in the desired position, the cutter C, which fits the hole in the nut, is driven into the hole cutting off the exposed thread of the bolt. A piece of round iron is then driven through the hole and is bent over on each end. This positively locks the nut on the bolt and does

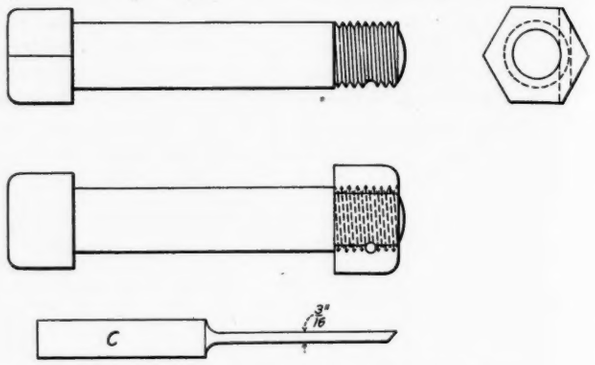


Fig. 89—Device for Locking a Nut on a Bolt.

not damage the bolt appreciably. The diameter of the hole is 3/16 in. for ¾ in., ⅞ in. and 1 in. nuts and ¼ in. for larger ones.

HANDLING CYLINDER HEADS.

Cylinder heads of locomotives equipped with a footboard extending over the steam chest are difficult to handle. The jib crane used for removing steam chest lids, cylinder heads, etc., cannot be used unless the foot plate is taken off. To overcome

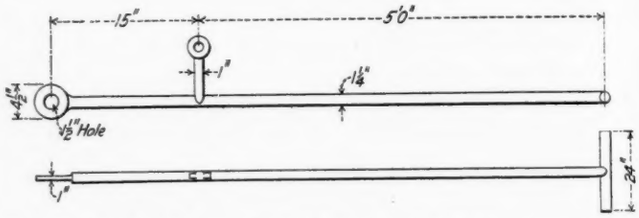


Fig. 90—Device for Handling Cylinder Heads on Locomotives.

the difficulty the bar shown in Fig. 90 is used. One end of it is put over the cylinder head casing stud, the hanger near the end is hooked into the jib crane chain and a man handles the tee handle on the long end. This device, while exceedingly simple, is a great convenience.

FOREIGN RAILWAY NOTES.

A German locomotive engineer says that the trains are doing much to destroy the birds. He has picked numbers of various kinds from an engine which runs about dawn, when the birds first seek food, and he estimates that this one engine kills some hundreds every month.

The Saxon state railways reward workmen who have been in their service 25 years and more with small sums of money, and at the same time distinguish them with marks of honor. Recently, on this small system, 30 men had served for 25 years, 22 for 30, 57 for 35, and 7 for 40 years.

The German lines had cost $109,054, per mile in 1909, which was 14.4 per cent. more than in 1899, and they earned $18,754 gross and $5,740 net per mile. In the United States the average capital was $59,259, gross earnings $10,356 and net earnings $3,505 per mile. The capital invested is about $60 per inhabitant in Germany, and $156 here.

The Cuban Railroad Company is soon to begin work on a new road from Manicaragua to Fomento, in Santa Clara Province, which will open up tranportation facilities to the cane growers in that country. The franchise for building the road has recently been granted by the government, and the terms stipulate that the work must begin within two years.

General News Section.

The Legislature of the State of Washington has adopted a full-crew law.

The Gulf, Colorado & Santa Fe has made increases amounting to about $10 a month in the pay of yardmasters and their assistants.

The Legislature of New Jersey has passed an employers' liability law, abolishing the fellow servant doctrine, and abolishing or modifying the rule that an employee assumes the risks of his employment.

At Pablo Beach, Fla., March 31, an automobile was run 50 miles in 37 min. 34 sec.; 70 miles in 52 min. 46 sec.; 100 miles in 74 min. 59 sec.; 130 miles in 99 min. 30 sec.; and 150 miles in 115 min. 18 sec.

The Mackinac Transportation Co. has ordered a new car ferry steamer to cost $500,000. With this boat, the company will have three vessels for carrying cars across the Straits of Mackinaw.

At Dallas, Tex., the Government has entered suits against the Atchison, Topeka & Sante Fe and the Southern Kansas Railway of Texas, charging violations of the 16-hour law, relative to the working time of trainmen.

The Supreme Court of Arizona has enforced a fine of $45,000. imposed by a lower court, on the Grant Brothers Construction Company, for violating the contract labor law in importing 45 aliens from Mexico to do common labor on railway grading.

The postmaster general has made a sweeping change in the management of the railway mail service, appointing Theodore Ingalls general superintendent, and sending the former general superintendent, Alexander Grant, to St. Paul to be superintendent of a division.

A press despatch from Kansas City says that the Atchison, Topeka & Sante Fe has dismissed 62 conductors, brakemen and porters, many of them long in the service; and that some of these men are to be prosecuted in the courts for irregularities in the collection of fares.

The Twentieth Century Limited Express of the New York Central eastbound, now has a regular sleeping car from Buffalo to New York. The train leaves Buffalo at 12.15 a. m. It does not run into the station at Buffalo, and heretofore has taken no passengers from that city.

A bill for a public utilities commission has been passed by the lower house of the Iowa Legislature by a large majority. The bill provides for a commission of five men and extends and amplifies the railway law as has been done in New York and as is proposed in Pennsylvania.

Two electric furnaces have been installed at the University of Illinois for the purpose of investigating the changes in the mechanical and physical characteristics of cast iron during a "soaking" process. One is a Hoskins resistance furnace and the other a Colby induction furnace. Both are of 20 k. w. capacity.

Train service was inaugurated on the North Coast Railway (the new line of the Oregon-Washington Railroad & Navigation Company) on March 24, when a gasolene car left North Yakima, Wash, for Grandview, and a steam train left the same place for Walla Walla, Wash. The train dispatching is done by telephone.

The Oklahoma corporation commission has extended to September 1 the time in which the Atchison, Topeka & Santa Fe, the Chicago, Rock Island & Pacific, the Missouri, Kansas & Texas, the St. Louis, Iron Mountain & Southern, the St. Louis & San Francisco and the Fort Smith & Western are required to establish general offices in that state.

At Issy-Les-Moulineaux, France, March 31, Pierre Vedriene in an aeroplane descended at 8:30 a. m., after having made a flight of 208 miles in 132 minutes, or at the rate of about 90 miles an hour. The aviator was favored with a light breeze, but he says that his machine will go 81 miles an hour in a calm. He used a 50 h. p. Morane monoplane.

The Chicago, Milwaukee & St. Paul, and the Chicago, Milwaukee & Puget Sound will begin running through passenger trains between Chicago and Puget Sound on May 28. One through train will leave Chicago every morning and another every evening. The same will be true of the service eastbound. One of the trains will be called the "Olympian" and the other the "Columbian."

The river section of the La Salle street tunnel under the Chicago river at Chicago, was sunk into place on April 2. The tunnel section was built in a plant near Halsted and Twenty-second streets, and was towed up the river to its place by tugboats. The section that was so built is 278 ft. long, 41 ft. wide and 24 ft. high. The methods of building and placing this tunnel are practically identical with those used in placing the Detroit river tunnel.

The Chicago & North Western, co-operating with the Iowa State Agricultural College, will run a special train over its lines in Iowa from March 27 to April 15, to carry lecturers on live-stock subjects. The train will consist of three cars, in one of which lectures will be given on hog-raising; in another lectures will be given to women on cooking meat, and in the third talks will be given to boys and girls on poultry, cows and packing-house processes.

An increase of about 8 per cent. in wages was granted to the 1,300 telegraphers of the Illinois Central on March 31, the increase to date from March 1. The men asked for an increase of 25 per cent., and demanded that 300 telegraphers who were discharged within the last ten days be reinstated, but when advised that the retrenchments were made to cut down expenses the settlement offered was accepted as satisfactory. This advance will add about $80,000 a year to the expenses of the Illinois Central.

The Missouri Pacific, in connection with the Pennsylvania Lines, now runs a fast mail train between New York and Kansas City, by which eastern mail will reach Kansas City. The Pennsylvania train, which is composed of six mail cars, leaves New York at 6.30 in the evening and arrives in St. Louis at 5.25 p. m. of the next day, making the same time as the "24-hour St. Louis." The Missouri Pacific train, which is also composed of six mail cars, leaves St. Louis at 6 p. m. and arrives in Kansas City seven hours later.

The Railway Benevolent Institution of England proposes to perpetuate the memory of King Edward VII by raising a fund to be used to provide annuities for poor widows of railway employees. It is to be called The King Edward VII Memorial Fund, for relieving distressed widows of railway employees, anywhere in the United Kingdom. A circular asking for subscriptions has been issued by the president of the institution, Chairman Claud J. Hamilton, of the Great Eastern Railway and Mr. Butterworth (N. E. Railway), chairman of the board of management.

The Legislature of Pennsylvania has now before it a bill known as the Public Service Company Law, presented by representative Alter, which, if passed, will create a public service commission of five members, and abolish the present railroad commission. The bill fills 63 pages, and, like the existing law of New York, provides for complete control by the State of railways and all public service corporations or companies. Full power is given to the commission to change rates, regulate facilities, establish standards, etc. The yearly salaries named in the bill are: For commissioners, $8,000 each; secretary, $4,000; counsel, $7,500 and $4,000, and marshal, $3,000.

Counsel for the so-called "beef trust" in proceedings in the Federal Court at Chicago, have attacked the constitutionality of the Sherman anti-trust act. The case is that growing out of the indictment of various packing companies and their principal officers for alleged violations of this law. The ground of attack is stated as follows: "Section 2 of the act, with the violation of which these defendants are charged, does not create any crime, as it does not define any offense against the United States with sufficient certainty to inform these defendants of the nature of the offense or crime, with which they are charged, and in so far as it undertakes to create a crime, is invalid, void and contrary to the constitution of the United States."

Carl R. Gray, senior vice-president of the St. Louis & San Francisco, went to Jefferson City, the capital of Missouri, on March 29, as a representative of the Missouri railways' legislative committee, and set forth objections which the roads have to a number of bills now in the hands of Governor Hadley. The measures opposed are: That prohibiting a railway from charging a higher passenger rate between any two points on its line than it does between any other two points; that giving the State Railway Commission power to fix passenger rates within the maximum established by law; that requiring railways and other corporations to pay their employees weekly or bi-monthly, and that making it unlawful for a railway or street car company to obstruct a street or crossing more than five minutes. Governor Hadley promised to give the railway officers a hearing on these bills.

The reports of the relief departments of the Pennsylvania Railroad system show that since these departments were established 25 years ago more than 30 million dollars in benefits have been paid to members or their families. During the month of February the benefits amounted to $230,338. The Long Island Railroad, now a subsidiary of the Pennsylvania, established an Employees Mutual Relief Association in the same year that the Pennsylvania established its fund, and since that time $797,671 has been distributed in benefits to Long Island employees or their families. Out of a total of 7,959 employees on the Long Island on March 1, 6,499 were members of the Mutual Relief Association. On the Pennsylvania lines east of Pittsburgh on March 1 the membership was 114,968 out of a total of 130,144 employees, and on the lines west out of a total of 53,911 employees 46,523 were members of the fund.

The report of Paul P. Bird, chief smoke inspector of the City of Chicago, made to Mayor Busse, covering the administration that is now closing, says that the railways are the chief contributors to the city's smoke nuisance, and recommends the early provision of measures forcing the roads to electrify their terminal lines. The new Association of Commerce Commission that is to investigate the problem of electrification was organized at a meeting of the members April 1. Jesse Holdom was made chairman, T. E. Donnelly vice-chairman, and Frederick W. Rawson secretary. A committee composed of Milton J. Foreman, Harrison D. Riley, and W. A. Gardner reported that in their opinion the investigation of the commission should include "First, the necessity for the proposed change; second, the mechanical practicability of such change; and, third, the commercial feasibility thereof." The committee's report was accepted and it was decided to take up the three portions of the investigation simultaneously. Meetings of the commission are to be held on alternate Fridays.

The appellate term of the New York Supreme Court has decided in a case prosecuted by Gimbel Brothers against persistent loan sharks, who had lent money to employees of Gimbel Brothers at from 175 to 390 per cent. per annum, that the loan company has no valid right to the wages of the employees. The law of New York provides that in order to obtain a valid claim on the paymaster the claimant must have given proper notice to the employer within three days after making a loan on account of wages. It appears that, in order to carry out their promise of secrecy, lenders of this class have delayed notifying the employer until the borrower has defaulted in a payment. The court holds that in such a case the loan company cannot sustain its claim. Mr. Ham, agent for the Russell Sage Foundation, reporting this decision, says that prominent drygoods firms in New York have abandoned the rule forbidding employees to borrow money, and have established departments to lend money to deserving employees when in temporary pressing need; and he says also that two railway companies and a large telegraph company are among the concerns which recently have taken action of this kind, looking to the benefit of the employees.

The Loetschberg Tunnel.

The Loetschberg tunnel, described in the *Railway Age Gazette* of July 2, 1909, through the Bernese Alps, Switzerland, was holed through on March 31, after four and a half years' work and an expenditure of about $20,000,000. This tunnel, which is the third longest in Europe, is about nine miles long, as compared with the nine and a quarter miles of the St. Gothard tunnel and the 12½ miles of the Simplon tunnel. When the Loetschberg tunnel is completed, there will be a direct route from Milan, Italy, to Berne, Switzerland, and thence to Calais, France, and Boulogne. The distance from Milan to Calais by this route will be nearly 80 miles shorter than the existing route. The tunnel will be double-tracked throughout. At its highest point the tunnel is about 4,054 ft. above sea level. It has an average grade of 0.7 per cent. and a maximum grade of 2.7 per cent. The gage is standard. The tunnel is 36 ft. wide and 19½ ft. high. The contract for the tunnel, signed in August, 1906, called for its completion in five years, the projector securing a 99-year franchise. Fifty lives were reported lost during the work, and several hundred laborers were injured.

Freight Car Demurrage in California.

The fact that the California State Railroad Commission had ordered a reduction in the rate of demurrage on freight cars in that state from $6 a day to $3, was noticed in the *Railway Age Gazette* last week. In view of the marked success of the $6 rate in reducing delays to freight cars, it will be interesting to watch the result of this reduction of 50 per cent. For the month of February last, Mr. Mote, manager of the Pacific Car Demurrage Bureau, reports that six times as many one dollar cars (those which are not subject to the California law, because engaged in interstate commerce), were held overtime as six-dollar cars. Will the proportion be the same when the higher penalty is reduced one-half? These percentages, which have been reported by Mr. Mote for 19 months, have been quite uniform, showing unquestionably that a high rate does accomplish its purpose. In February, in Mr. Mote's territory, the number of six-dollar cars held longer than the free time was .84 per cent., or less than one car in a hundred. This is the lowest percentage ever reported, notwithstanding the fact that the rainfall throughout California during the month of February was the heaviest for years past. The percentage of one-dollar cars was 5.04. Continuing the comparison which he has been making of conditions in California with those in other states, Mr. Mote says:

Does it not seem strange that, except in California, practically every public movement toward the prevention of car shortages, blocked terminals, delayed and irregular movement of frieght, has had a direct tendency to promote instead of prevent such conditions? How can the situation possibly be bettered by lengthening the free time limit to release cars; to lower the demurrage rate to a point below the value of the car for storage or speculative purposes, making it possible for gamblers in certain commodities to block, corner and control not only the terminals but the markets as well; to allow extra time for stops in transit; for diversion, reconsignment, inspection, grading, milling, surrender of bills of lading, payment of freight charges, etc?

It has been charged that the California railways favor the $6 rate purely because their revenues from demurrage have been increased sixfold over the period in which the $1 rate was charged. The fatal defect in this charge lies in the assumption that demurrage accrues at the $6 rate on the same number of cars as at the $1 rate, while as a matter of fact, in proportion to the number subject to each rate, there are practically six $1 cars held overtime to each $6 car, and as the average delay is one day longer on $1 cars than on $6 cars, and notwithstanding an increase of 40 per cent. in the number of cars handled, the demurrage charged during the seventeen months after the adoption of the $6 rate was approximately $30,000 less than during the same period before its adoption; and had all cars been subject to the same rate the reduction would have been approximately $46,000.

Head of Correspondence School Arrested.

George H. Baker, president and general manager of the Railway Educational Association, Paul J. Gallagher, secretary, and John A. Jenkins, a member of the board of directors of the association, were arrested in Brooklyn, N. Y., on March 31, by post office inspectors on the charge of misusing the mails in obtaining money under fraudulent pretenses.

Chief Inspector Dickson says that Baker and his associates carried on a railway correspondence school for brakemen and

firemen, with branches in every important city in the country. Complaints were received that the association advertised that it would procure employment for those registered on its books within thirty days or refund the tuition fees. It is alleged that the men chosen and recommended for positions were rejected because the association made no discrimination in accepting students (accepting those physically disqualified for railway service) and that fees paid in were never returned. Baker said that a year ago, in Washington, before Judge Goodwin, assistant attorney general for the post office department, the school was thoroughly investigated, every detail of it being discussed without a single feature of the work being criticised.

Bills Affecting Railway Operation Introduced in the State Legislatures.

The accompanying table showing the number of bills affecting railway operation introduced in the various state legislatures during the sessions of 1911 was prepared by the Special Committee on Relations of Railway operation to Legislation. It will be noted that the bills referred to do not include those dealing with traffic, accounting, etc., but relate entirely to operation.

The state in which the largest number of bills was introduced was Missouri, where there were 64. It is an interesting fact that one of the most active agitators against the railways in the legislature of that state was William H. Phelps. Mr. Phelps was formerly better known as the principal lobbyist of the Missouri Pacific at Jefferson City, the capital of Missouri. When the lobby was abolished, Mr. Phelps got himself elected to the legislature, and during the last session he was as active inside the legislature in promoting bills to regulate railways as he formerly was outside of the legislature in opposing bills to regulate railways.

The state where the second largest number of bills was introduced was Indiana, with a total of 34. One is surprised to find that the state in which the third largest number of bills was introduced is Wisconsin, where it would naturally be supposed that after so many years of anti-railway legislation laws to regulate almost everything regulatable had been enacted. The next state in the number of bills introduced is Kansas. The railway regulating fever seems to be subsiding in some states where it has in the past waged most fiercely. Only nine bills for the regulation of railway operation were introduced in Texas and only 11 in Oklahoma.

It will be noted that the largest number of bills introduced was for the purpose of regulating the experience and number of employees serving in train crews, and the second largest for the regulation of the equipment of passenger trains.

LEGISLATIVE PROPOSALS AFFECTING RAILWAY OPERATION.

SUBJECTS.	Alabama	Arkansas	California	Colorado	Connecticut	Delaware	Idaho	Illinois	Indiana	Iowa	Kansas	Massachusetts	Michigan	Minnesota	Missouri	Montana	Nebraska	Nevada	New Hampshire	New Jersey	New York	North Carolina	North Dakota	Ohio	Oklahoma	Oregon	Pennsylvania	Rhode Island	South Carolina	South Dakota	Texas	Utah	Vermont	Washington	West Virginia	Wisconsin	Wyoming	TOTAL
1. *Employees—*																																						
a. Full crews and experience	3	1	2	1	1	1	3	1	1		1	2	3	1	5	2	2	2	3	2	4	2	1	3	2	1	1		1		1		2	2	1	1	1	57
b. Hours of service		2		1	1							1			1	2	2		1					1	1	1										5		19
c. Service Letters and time of payment						2		2		2			1		2	2		4	1	1				1	1		1		1		2			1		2		26
d. Terms of employment	2					1										1		3								2												9
e. Uniforms											1																											1
2. *Arbitration—*																																						
a. Compulsory	1																									1								1				3
b. Voluntary	1		1									1		1							1												1			1		7
3. *Train Rules—*																																						
a. Uniform									1																				1		1							3
4. *Equipment—*																																						
a. Caboose	2						1	2				1		1	1	1					1		1		1					1					2	1		16
b. Boiler Inspection								1								1																	1			1		4
c. Headlights	1			1		1			2						2		1						1	1					4	1					1		16
d. Safety Appliances								1							2														1		1		1					6
e. Repair of	1									2																												3
f. Appliances required						1		3			1					1																		1					7
g. Examination of								1																														1
h. Specifications													1																									1
5. *Passenger Trains—*																																						
a. To be run				1	1			1	2		1				3							1	2		1				3	1					2		11
b. Stops							1	2							4								3						1	2					1		15
c. Equipment of	1		4		1	2	1	1	1			4		1	7		2		2	1	4						1	2	1	2			2	2	1		46
d. Baggage		1	1					1																					1									4
e. Drinking on							2					1		1		1							1													1		7
f. Ejection from								1																														1
6. *Freight Trains—*																																						
a. Speed of Live Stock									1						1	1							1		2											2		8
b. Sunday Trains																													1									1
c. Speed of Dead Freight																													1							1		2
d. Handling of Explosives																										1									1			2
7. *Cars—*																																						
a. To be Furnished		2															1		1											1						1		6
b. Demurrage	1	1					1			1							1																2			1		8
8. *Block and Other Signals—*																																						
a. Block and Interlocking			3			1		3																														7
b. Switch Lights	1							2																														3
9. *Clearances—*																																						
a. Required								2		1		1	2										1	1							1			1				10
10. *Crossings—*																																						
a. Required								1		2					3		2			2					2					1						2		15
b. Protection								1					1		4		2						1				1			1		1	1	1				14
c. Separation of Grades							1	2		1							2									1									1		8
11. *Maint. of Way—General—*																																						
a. Track Scales and Weighing								1					1	2								1	1	1		1			1									9
b. Burning Weeds		1						1		1					1		1							1											1			6
c. Fencing		1	2			1	1						1	3	1	3			1					1										1		1		17
d. Drainage							1	1						1																								3
e. Inspection											1																												1
f. Double Track												1																											1
12. *Stations—*																																						
a. Required		1		1				1							4						2		1		1				1				1					13
b. Equipment of						1		1		3					8		1						2							1			1			2		20
c. Stock Yards					1					3							2													3								9
d. Shop Equipment															1											1									2			4
e. Track Connections															1		1						2							1				1		1		7
13. *Hospitals and Relief Depts.—*																																						
a.		1																				1		1					1		1							5
14. *Claims—*																																						
a. When to be paid		1		1					1			2		1	4														4						1	2		17
15. *Trespassers—*																																						
a.			1		1	1		1							2																				1			7
16. *Reports—*																																						
a. Accidents											1				2			1							1			1						1				7
b. Delays															1																							1
TOTAL	3	14	16	10	7	5	12	13	34	23	13	7	10	64	13	22	10	8	7	12	5	17	11	11	11	3	2	24	11	9	1	10	10	12	29	5	474

Pittsburgh Traffic Club.

The Traffic Club of Pittsburgh at its ninth annual dinner, held at the Fort Pitt Hotel on the evening of March 30, entertained a large number of prominent railway officers from Pittsburgh, Chicago, Philadelphia, New York and other places. Two prominent speakers were George F. Baer, president of the Philadelphia & Reading, and ex-Governor F. S. Black of New York. Mr. Baer said, in part:

"No greater evil can befall a people than the uncertainty of the law. Unintentional violation of it is followed by government persecution and prosecution, and the thing becomes intolerable. Just now there seems to be a system of government spies watching the details of operation, and when there is slight unintentional violation of the law the railways are criminally proceeded against.

"In the wise system of laws instituted by our ancestors, in order to constitute a man guilty of crime, criminal intention must be shown; but that wise ruling seems to have been lost for the time being. Was it not Cicero who said: 'The rigor of the law was the sum of injustice'?

"I think it is generally true, that whatever judgment one may have on the wisdom of a ruling, if its meaning is made clear you can, with more or less sacrifice, obey the ruling. And it is necessary that you should obey it, otherwise organized society becomes a rope of sand. I have always admired the stoical philosophy of the Philadelphia German soldier, as told by former Governor Pennypacker.

"In the West Virginia campaign one of Mosby's men captured a Pennsylvania Dutchman. In taking him to their camp they said to him, 'You may prepare to be shot in the morning.' He replied, 'Well, if that's your rule, it's all right.'"

I believe, as a lawyer, that to the extent that the Interstate Commerce Commission is given power, on its own initiative, to make rates and thereby control property which the nation does not own, it is a delegation of legislative power which—if it existed at all in Congress—cannot be delegated. The power will fall by its own excessive weight. The Interstate Commerce Commission, as a mere physical problem, cannot fix rates of transportation for the railways of the United States.

Mr. Black said:

"The problems we deal with now are too large to be hurried. The tariff, control of corporations, the rights of labor and money in their joint results, amendments to the Constitution, questions so vital and far-reaching that they involve both our progress and stability—all these are on the table now and being settled offhand by Solomons whose wisdom, unborn five years ago, is now in full flower. These wise men are as much like the old statesmen as the Rough Riders are like the old guard of Napoleon. We shall keep going for a long time yet, but is it not worth while to look around? . . . I protest against the spirit of suspicion and unrest that so distorts our views and puts hostility in the place of friendship. I protest against those who live on the credulity of their fellow men and would for their own gain substitute revenge for hope.

"If I could reach all the people on all the railways out of Pittsburgh I would say, stop the constant nursing of your wrongs, which have been proclaimed and magnified until they are almost a National lamentation.

"Change these lonesome sons for National beautitudes; blessed are they who are willing to shoulder part of the blame for their own failure, and who know that to disagree is not always to be dishonest; blessed are they who know that cheating in labor is as bad as cheating in money, and that a 30-minute hour is as dishonest as a 50-cent dollar; blessed are they whose vision is clear enough to tell a real from a fancied wrong, and who dwell rather upon the blessings they see than upon the hardships they imagine."

International Association of Navigation Congresses.

The International Association of Navigation Congresses will hold its twelfth international congress in Philadelphia, Pa., some time during the year 1912. A circular has been published by the executive committee giving general information on the association, such as its history, methods, etc., then describing the exact nature of the next congress, and ending with the regulations and a list of membership. The subjects which will be discussed at this congress are under the two main heads, Inland Navigation and Ocean Navigation. Under Inland Navigation, among others, papers will be presented on Improvement of Inland Waterways, Dimensions of Canals and Equipment, Best Methods for Facilitating the Transfer of Freight Between the Waterway and Railway. Under Ocean Navigation, among others, papers will be presented on Mechanical Equipment of Ports and Bridges and Tunnels Under Waterways Used for Ocean Navigation. All correspondence should be addressed to the general secretary of the congress, Room 344, The Bourse, Philadelphia.

International Railway Fuel Association.

At the third annual convention of the International Railway Fuel Association, to be held at the Hotel Patten, Chattanooga, Tenn., May 15 to 18, the following papers will be presented for discussion: Fuel Investigations Under the Bureau of Mines, by Dr. J. A. Holmes, director of the Bureau of Mines; How to Organize a Railway Fuel Department and Its Relation to Other Departments, by T. Duff Smith, fuel agent of the Grand Trunk Pacific; Testing of Locomotive Fuel, by F. O. Bunnell, engineer of tests, Rock Island Lines; Standard Locomotive Fuel Performance, by F. C. Pickard, assistant master mechanic of the Cincinnati, Hamilton & Dayton; The Railway Fuel Problem in Relation to Railway Operation, by R. Emerson, engineer track economics, Atchison, Topeka & Sante Fe; Petroleum, Its Origin, Production and Use as Locomotive Fuel, by E. McAuliffe, general fuel agent of the Frisco Lines.

American Railway Industrial Association.

The annual meeting of the American Railway Industrial Association will be held at the Hotel Cadillac, Detroit, Mich., May 9 and 10. The program, as now made up, includes talks from Dr. J. L. Snyder, president of the Michigan Agricultural College, and Walter L. Moore, secretary of the National Association of Commercial Executives. Arrangements are being made for other speakers.

American Society of Civil Engineers.

At the meeting of the American Society of Civil Engineers on April 5, a paper entitled The Going Value of Water Works, by Leonard Metcalf and John W. Alvord, members of the American Society of Civil Engineers, was presented for discussion. This paper was printed in the *Proceedings* for February, 1911.

International Master Boiler Makers' Association.

The fifth annual convention of the International Master Boiler Makers' Association will be held at the Rome Hotel, Omaha, Neb., May 23-26.

American Society for Testing Materials.

The annual meeting of the American Society for Testing Materials will be held at the Hotel Traymore, Atlantic City, N. J., June 27-July 1.

Traveling Engineers' Association.

The annual convention of the Traveling Engineers' Association will be held at the Hotel Sherman, Chicago, August 29-September 1.

Association of Railway Claim Agents.

The annual convention of the Association of Railway Claim Agents will be held in Montreal, Que., May 24-26.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

Air Brake Association.—F. M. Nellis, 53 State St., Boston, Mass.; annual convention, May 23-26, Chicago.

American Association of Demurrage Officers.—A. G. Thomason, Scranton, Pa.; next meeting, June 22, 1911, Niagara Falls, N. Y.

American Association of General Passenger and Ticket Agents.—C. M. Burt, Boston, Mass.; next meeting, St. Paul, Minn., Sept. 19, 1911.

American Association of Freight Agents.—R. O. Wells, East St. Louis, Ill.; June 20-23, Kansas City, Mo.

American Association of Railroad Superintendents.—O. G. Fetter, Carew building, Cincinnati, Ohio; 3d Friday of March and September.

American Electric Railway Association.—H. C. Donecker, 29 W. 39th St., New York.

American Railway Association.—W. F. Allen, 24 Park Place, New York; May 17, New York.

AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—C. A. Lichty, C. & N. W., Chicago; Oct. 17-19, 1911, St. Louis, Mo.
AMERICAN RAILWAY ENGINEERING ASSOCIATION.—E. H. Fritch, Monadnock Block, Chicago.
AMERICAN RAILWAY INDUSTRIAL ASSOCIATION.—G. L. Stewart, St. L. S. W. Ry., St. Louis, Mo.; May 9-10, 1911, Detroit, Mich.
AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago; June 14-16, 1911, Atlantic City, N. J.
AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—O. T. Harroun, Bloomington, Ill.
AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.; June 27-July 1, Atlantic City, N. J.
AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St., New York; 1st and 3d Wed., except June and August, New York.
AMERICAN SOCIETY OF ENGINEERING CONTRACTORS.—D. J. Haner, 13 Park Row, New York; 3d Tuesday of each month, New York.
AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., New York; next convention, May 30-June 2, Pittsburgh, Pa.
ASSOCIATION OF AMERICAN RAILWAY ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago; April 26, 1911, New Orleans, La.
ASSOCIATION OF RAILWAY CLAIM AGENTS.—J. R. McSherry, C. & E. I., Chicago; May 24-26, Montreal, Can.
ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.—Jos. A. Andreucetti, C. & N. W. Ry., Chicago; semi-annual, June 16-17, Washington, D. C.
ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, 135 Adams St., Chicago; June 19, 1911, Boston, Mass.
ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 24 Park Pl., New York; June 20-21, Cape May City, N. J.
CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tuesday in month, except June, July and Aug., Montreal.
CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursdays, Montreal.
CAR FOREMAN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month, Chicago.
CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Thurs. in Jan., and 2d Fri. in March, May, Sept., Nov., Buffalo, N. Y.
CIVIL ENGINEERS' SOCIETY OF ST. PAUL.—D. F. Jurgensen, 116 Winter St., St. Paul, Minn.; 2d Monday, except June, July and Aug., St. Paul.
ENGINEERS' SOCIETY OF PENNSYLVANIA.—E. R. Dasher, Box 704, Harrisburg, Pa.; 1st Monday after 2d Saturday, Harrisburg, Pa.
ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—E. K. Hiles, 803 Fulton building, Pittsburgh; 1st and 3d Tuesday, Pittsburgh, Pa.
FREIGHT CLAIM ASSOCIATION.—Waren P. Taylor, Richmond, Va.; June 21, St. Paul, Minn.
GENERAL SUPERINTENDENTS' ASSOCIATION OF CHICAGO.—H. D. Judson, 209 East Adams St., Chicago; Wed. preceding 3d Thurs., Chicago.
INDIANAPOLIS RAILWAY AND MECHANICAL CLUB.—B. S. Downey, C., H. & D., Indianapolis, Ind.
INTERNATIONAL MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York; May 23-26, Omaha, Neb.
INTERNATIONAL RAILWAY CONGRESS.—Executive Committee, rue de Louvain, 11 Brussels; 1915, Berlin.
INTERNATIONAL RAILWAY FUEL ASSOCIATION.—D. B. Sebastian, La Salle St. Station, Chicago; May 15-18, 1911, Chattanooga, Tenn.
INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—L. H. Bryan, D. & I. R. Ry., Two Harbors, Minn.; July 25-27, Chicago.
INTERNATIONAL RAILROAD MASTER BLACKSMITHS' ASSOCIATION.—A. L. Woodworth, Lima, Ohio.
IOWA RAILWAY CLUB.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August, Des Moines.
MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago; June 19-21, 1911, Atlantic City, N. J.
MASTER CAR AND LOCOMOTIVE PAINTERS' ASSOCIATION, OF UNITED STATES AND CANADA.—A. P. Dane, B. & M., Reading, Mass.; Sept. 12-15, 1911, Atlantic City, N. J.
NEW ENGLAND RAILROAD CLUB.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tuesday in month, except June, July, Aug. and Sept., Boston.
NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August, New York.
NORTHERN RAILWAY CLUB.—C. L. Kennedy, C., M. & St. P., Duluth, Minn.; 4th Saturday, Duluth.
OMAHA RAILWAY CLUB.—A. H. Christiansen, Barker Block, Omaha, Neb.; second Wednesday.
RAILROAD CLUB OF KANSAS CITY.—C. Manlove, 1008 Walnut St., Kansas City, Mo.; 3d Friday in month, Kansas City.
RAILWAY CLUB OF PITTSBURGH.—C. W. Alleman, P. & L. E., Pittsburgh, Pa.; 4th Friday in month, except June, July and August, Pittsburgh.
RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, Bethlehem, Pa.; June 13, New York; annual, Oct. 10, Colorado Springs, Colo.
RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C, Collinwood, Ohio; annual, May 22-24, 1911, Milwaukee, Wis.
RICHMOND RAILROAD CLUB.—F. O. Robinson, Richmond, Va.; 2d Monday, except June, July and August.
ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.; Oct., 1911, St. Louis.
ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug., St. Louis.
SOCIETY OF RAILWAY FINANCIAL OFFICERS.—C. Nyquist, La Salle St. Station, Chicago; Sept. 12-14, St. Paul, Minn.
SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—E. W. Sandwich, A. & W. P. Ry., Montgomery, Ala.; semi-annual, April 20, Atlanta, Ga.
SOUTHERN & SOUTHWESTERN RAILWAY CLUB.—A. J. Merrill, Grant bldg., Atlanta, Ga.; 3d Thurs., Jan., March, May, July, Sept. Nov., Atlanta.
TOLEDO TRANSPORTATION CLUB.—L. G. Macomber, Woolson Spice Co., Toledo, Ohio; 1st Saturday, Toledo.
TRAFFIC CLUB OF CHICAGO.—Guy S. McCabe, La Salle Hotel, Chicago; meetings monthly, Chicago.
TRAFFIC CLUB OF NEW YORK.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August, New York.
TRAFFIC CLUB OF PITTSBURGH.—T. J. Walters, Oliver building, Pittsburgh, Pa.; meetings monthly, Pittsburgh.
TRAIN DESPATCHERS' ASSOCIATION OF AMERICA.—J. F. Mackie, 7042 Stewart Ave., Chicago; annual, June 20, 1911, Baltimore, Md.
TRANSPORTATION CLUB OF BUFFALO.—J. M. Sells, Buffalo; first Saturday after first Wednesday.
TRANSPORTATION CLUB OF DETROIT.—W. R. Hurley, L. S. & M. S., Detroit, Mich.; meetings monthly.
TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y.; annual, August 29-September 1, Chicago.
WESTERN CANADA RAILWAY CLUB.—W. H. Rosevear, P. O. Box 1707, Winnipeg, Man.; 2d Monday, except June, July and August, Winnipeg.
WESTERN RAILWAY CLUB.—J. W. Taylor, Old Colony building, Chicago; 3d Tuesday of each month, except June, July and August.
WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, 1735 Monadnock Block, Chicago; 1st Wednesday in month except July and August, Chicago.
WOOD PRESERVERS' ASSOCIATION.—F. J. Angier, First National Bank bldg., Chicago.

Traffic News.

The Wells-Fargo Express Company has purchased the business of the Alaska Pacific Express Company of Seattle, the pioneer express company of the northern district.

The Lehigh Valley has followed the Lackawanna in withdrawing from the Trunk Line agreement for the distribution of the west bound emigrant traffic from New York City.

The Atchison, Topeka & Sante Fe has been indicted by the United States District Court at Los Angeles, on a charge of granting rebates to the Grand Canyon Lime and Cement Company.

Judge Smith McPherson, of the Circuit Court of Appeals at Council Bluffs, Iowa, on March 29 temporarily enjoined the Iowa railway commission from putting into effect the reduced express rates which were ordered some time ago to become effective on March 30.

The Chamber of Commerce and other commercial bodies of New York City have again presented to the Interstate Commerce Commission their complaint against the differential system under which freight rates between New York and the West are higher than the rates to and from Philadelphia, Baltimore and Newport News.

The National Wool Growers' Association has filed with the Interstate Commerce Commission a petition for a general reduction in the rates on wool from the Pacific coast and Rocky Mountain states to Boston, New York, Chicago and other eastern markets. It is complained that wool in any quantity is charged at the second-class rate, whereas textile fibres similar in weight and value are given fourth-class rating in carloads and are frequently moved on commodity rates at much less than fourth-class rates.

The Pennsylvania Company and the Pittsburgh, Cincinnati, Chicago & St. Louis have petitioned the Pennsylvania courts at Pittsburgh to annul the 2-cents-a-mile passenger fare law. Co-incident with this news comes the statement from the State Railroad Commission of Michigan, that the Michigan Central Railroad, whose passenger receipts in 1906 averaged $3,639 a mile, earned in 1910, with a 2-cent fare, $4,306 a mile. Similar increases in gross receipts, under reduced fares, are reported from other Michigan roads.

The railways have asked the Interstate Commerce Commission to postpone indefinitely hearings on the proposed increases in class and commodity rates between St. Louis, Ohio river crossings and southern points. The roads last August filed tariffs providing for increases of 10 per cent. The Business Men's League of St. Louis filed a complaint regarding the advance and the proposed rates were suspended. The action of the roads in asking for an indefinite postponement of hearings means that the proposed advances will not be put into effect.

The Pacific Coast Steamship Company has announced heavy reductions in its rates between San Francisco, San Pedro and San Diego. This action has been taken to meet the competition of the Pacific Coast Navigation Company, which is operating two boats, the Yale and the Harvard. The rates between San Francisco and Portland also have been reduced. The passenger rate from San Francisco to San Pedro is reduced from $11.50 to $8.35; from San Francisco to Santa Barbara from $8.50 to $7, and from San Francisco to San Diego from $14.50 to $10.

The Texas railway commission has ordered that suit be brought against the Galveston, Harrisburg & San Antonio, the Gulf, Colorado & Santa Fe, the Missouri, Kansas & Texas, the International & Great Northern, the Trinity & Brazos Valley, the Texas City Terminal and the Galveston, Houston & Henderson, for failure to absorb loading charges, in accordance with a ruling of the commission. The order for the suits states that the roads absorbed the charges before the commission made its ruling and that they must now continue to do so.

Total January Earnings and Expenses.

Logan G. McPherson, director of the Bureau of Railway Economics in Bulletin Number 10 giving a summary of revenues and expenses of steam roads in the United States for

the month of January, 1911, says for the month of January, 1911, there was an increase in total operating revenue, over the same month of 1910, of $4,500,000 which, however, was almost wholly acocunted for by the fact that the report covers 3,700 more miles than in 1910. The increase per mile of line was only $3.95 or 0.4 per cent. For this trifling increase, passenger revenue was almost entirely responsible, freight revenue per mile actually declining 1.7 per cent. Operating expenses increased per mile over the same month of the previous year 3.2 per cent., the largest increase being in transportation expenses. There was a decline of 4.4 per cent. in the per mile expenditures for maintenance of way. With this showing it was to be expected that net operating revenue would show a falling off. On the per-mile basis the decrease was 7 per cent. Operating income, which is net revenue with taxes and outside operations included, shows a decrease of 9 per cent.

Increase in operating revenues was almost wholly confined to the southern group, where an increase per mile of 7.4 per cent. is shown, the western group showing an actual decline, and the eastern a nominal increase. This increase in the South is present in both freight and passenger business, while in both the other groups freight revenue decreased. In the matter of expenses, the South shows the largest increase per mile, nearly 10 per cent., while an actual decrease occurred in the West of 2.1 per cent. In the East, the most significant increase was in transportation expenses, 8.5 per cent.; the South in maintenance of equipment, 11.8 per cent. The statistics for the western roads should be especially noticed, for they show a decrease per mile of 15.8 per cent. in maintenance of way and nearly 2 per cent. in transportation expenses. The results of this policy are revealed in the statistics of net earnings. While the East shows a decrease per mile of 16 per cent. in net revenue, and while the South, in spite of its increased gross, shows an increase of only 2.2 per cent. in net, the West with a decrease in gross, shows an increase of 2.1 per cent. in net revenue. In other words, western roads in contrast with roads of the other two groups, were able to make heavy reductions in operating expenses, even in transportation expenses, where labor is the principal item, and were able in consequence to make practically as good a showing in net revenue as the southern roads with their increased gross earnings.

For the seven months of the fiscal year 1911, there is an increase of operating revenues per mile for all roads of 2.4 per cent. over the corresponding period of 1910. However, expenses increased 7.5 per cent., with the result that net revenue shows a decrease of 6.7 per cent. This decrease runs as high as 12 per cent. in the eastern group. In the southern group there is a slight increase amounting to 1 per cent. It is plain that the decrease for all roads is due to increased expenses rather than declining revenues, the greatest advance in expenses being found in the transportation account where the wage increases are mostly reflected.

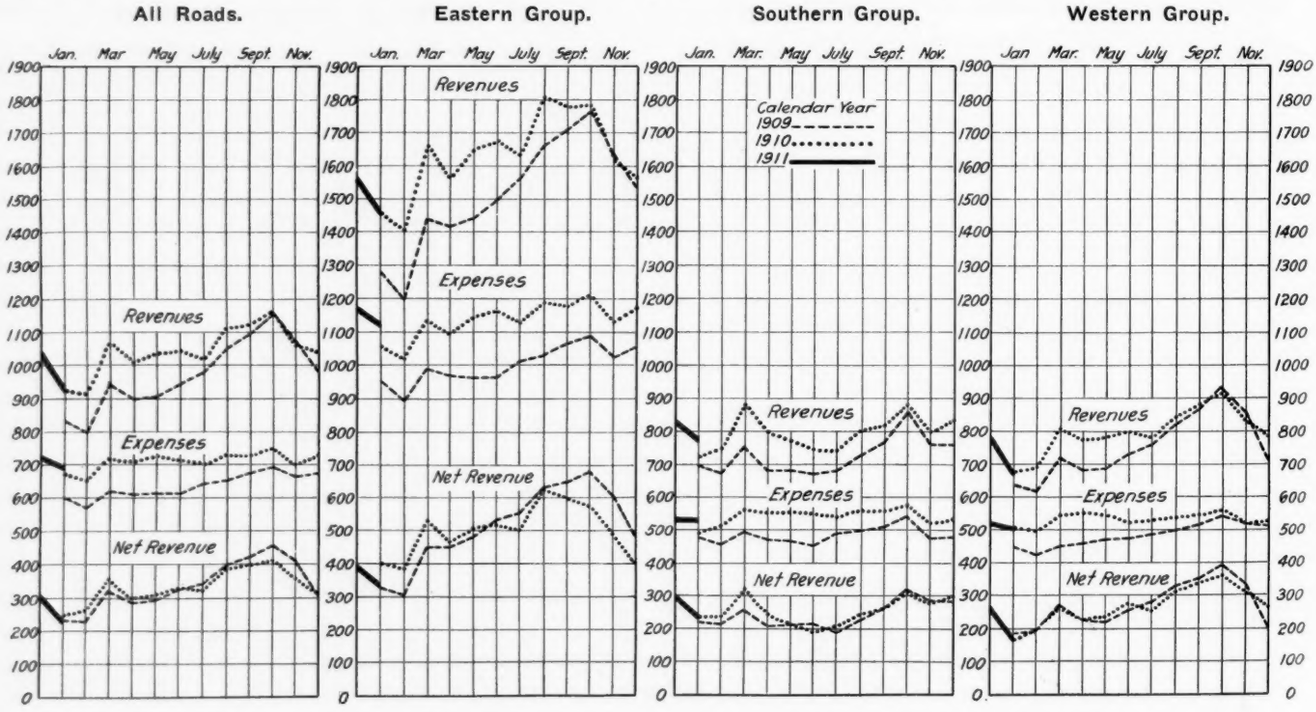
The accompanying chart shows the variation in revenues, expenses and net revenue for the separate months of the calendar years 1909 and 1910, and for January, 1911. It is of particular importance to note that there has been no improvement in January as compared with December, but rather a decline. For all roads there is a decline in net revenue as compared with December, 1910, of $76 per mile. This decline amounts to $55 per mile for the eastern roads, $56 for the southern roads and $91 for the western roads.

Ratio of Expenses to Total Operating Revenues.

	January, 1911.	January, 1910.	Fiscal year ended June 30, 1910.
Per cent. of total operating revenues:			
Maint. of way and structures	11.6	12.2	13.4
Maint. of equipment	17.2	16.9	15.0
Traffic expenses	2.3	2.2	2.0
Transportation expenses	40.9	38.9	33.4
General expenses	2.8	2.7	2.5
Total operating expenses	74.9	72.9	66.3

Hearing Regarding Pacific Coast Rate Cases.

Testifying before the Interstate Commerce Commission at Washington, D. C., last week, H. E. D. Jackson, secretary and traffic manager of the American Line Steamship Company, detailed at length facts regarding water competition between the Atlantic and Pacific coasts. He stated that there is both potential and actual water competition for transcontinental traffic and that there is competition among the water carriers. His company, operating in connection with the Tehuantepec Railway, competes with German, Japanese and other foreign lines. He predicted that water competition would become much more important when the Panama canal is open. Regarding the relations between the railways and the water lines, he said that the roads made rates of 30 cents per 100 lbs. from New York and New England across the continent to drive the clipper sailing ships around the Horn out of the business. They succeeded after a war raging from 1893 to 1900. Rates would be made a great deal higher across the country were it not for the water lines. The tonnage moved westward by the transcontinental roads between Atlantic coast and Pacific coast terminals is about 3,000,000 tons annually. About 250,000 tons are carried by water and by the Isthmian routes between the two seaboards every year, the water rates ranging from 20 to 50



Earnings and Expenses by Groups and of all Railways Showing a Three-Year Comparison.

per cent. less than those of the railways. The rates via the Tehuantepec Railway are divided into three parts, one-third going to the steamship line on the Atlantic, another third to the Pacific line and the last third to the Tehuantepec Railway.

Mr. Jackson denied that the railways dictate what rates his company shall charge. He testified that his line could not continue in business if it were not for its contracts to transport the Hawaiian sugar crop, amounting to 250,000 tons annually, to eastern ports of the United States. On this traffic it gets $9.50 a ton. On westbound shipments the company does business at Los Angeles, San Francisco, Sacramento, Stockton, Portland, Seattle, Tacoma and some other ports. There are 84 points in California which enjoy terminal rates.

The meaning and constitutionality of the fourth section of the Act to Regulate Commerce as amended by the Mann-Elkins Act were discussed by a number of lawyers, including Gardner Lathrop (Santa Fe); W. W. Cotton (O.-W. R. R. & N. Co.); C. W. Durbrow (Southern Pacific); H. M. Stephens, representing the shippers of Spokane; Byron Waters, representing the Counties Freight Bureau of Southern California. Mr. Lathrop said that while the wording of the law has been changed, the only change in its meaning is that, whereas formerly the roads could on their own initiative apply rates disregarding the long and short haul principle, now they must first get the consent of the commission. Any departure from the long and short haul principle which was legal under the old law is legal under the law as amended by the Mann-Elkins Act. Regarding the provision authorizing the commission to determine the extent of the differential allowable between the long haul and the short haul rates, Mr. Lathrop said that the commission could not exercise arbitrary descretion, but must fix a reasonable differential.

W. W. Cotton (Oregon-Washington Railway & Navigation Company) and Mr. Stephens of Spokane, agreed that in authorizing the commission to determine what differentials should be made. Congress had delegated legislative authority, which is unconstitutional. Mr. Stephens contended that eliminating this provision, which he regarded as unconstitutional, left a law absolutely prohibiting a greater charge for a short haul than for a long haul and that therefore the only way the roads can get authority to disregard the long and short haul principle in any case is to get the amended fourth section held confiscatory in its entirety.

Testimony was given to the effect that the Southern Pacific would suffer a direct loss of $800,000 and an indirect loss of $3,700,000 yearly if Pacific coast terminal rates were applied to intermediate points. George W. Luce, assistant to the vice-president of the Southern Pacific, and Edward Chambers, assistant freight traffic manager of the Santa Fe, were examined at great length regarding rates to intermountain and Pacific points. Much of the ground covered had been covered already in the hearings which preceded the rendering of the commission's opinion in the Pacific coast cases.

INTERSTATE COMMERCE COMMISSION.

The commission has issued revised regulations to govern the construction and filing of freight and passenger tariffs. One paragraph of the order reads: "Tariffs should not contain volumes of unnecessary rates, and it is undesirable to require the posting of large numbers of tariffs at points from which no shipments are likely to move. Therefore, until further ordered, carriers may file tariffs containing commodity rates applicable from known points of production without making such rates applicable from all intermediate points." The regulations also provide that hereafter reductions as well as increases in rates in a new tariff must be indicated.

Reparation Awarded.

Hartman Furniture & Carpet Co. v. Chicago, Rock Island & Pacific et al. Opinion by Chairman Clements.

Through rate of 49 cents per 100 lbs. on shipment of chairs from Malvern, Ark., via Thebes, Ill., to Milwaukee, Wis., found unjust in so far as it exceeded 39 cents.

Connection with Competing Electric Line Ordered.

Cincinnati & Columbus Traction v. Baltimore & Ohio Southwestern et al. Opinion by Commissioner Harlan.

A local law under which an electrically operated interurban line has no right to demand a switch connection and interchange of traffic with a steam railway is controlling only in so far as it relates to local traffic; it can not be permitted to operate as an impediment to the movement of interstate traffic after the Congress has legislated on the subject by requiring such connection and interchange under certain conditions which in this proceeding are shown to exist.

The commission ordinarily will not lend its aid to an effort by one carrier to secure traffic that is reasonably tributary to another line by compelling the latter to join with it in through routes and rates; but the theory as to what traffic is tributary to a particular railway must not be carried to such an extreme as to impose on shippers the burden of an unduly long wagon haul.

Through routes and through billing denied to points on the complainant's line where it parallels and closely approaches the tracks of the defendants, but required, on the special facts of the case, in the interest of shippers at other points from five to ten miles distant by the wagon roads. (20 I. C. C., 486.)

COURT NEWS.

The Supreme Court of the United States, in a decision by Chief Justice White, has decided against the Delaware, Lackawanna & Western in the suit brought by that road to enjoin the I. C. C. from enforcing its order requiring the road to give carload rates on freight consisting of equipment of shipments from different shippers, and made up by shipping agents.

The new Court of Commerce held its first public session at Washington, April 3, numbers of railway men who were in Washington on other business being present as spectators. The first cases before the court were those concerning switching changes in California, and the arguments of the first day were on the question whether the court could hear testimony, or should confine itself to an examination of the records of the cases as made up by the Interstate Commerce Commission.

The Supreme Court of the United States, in an opinion by Justice Lurton, has sustained the statute of Virginia prescribing a penalty upon telegraph companies for failure to transmit promptly messages filed with it. The case came to the Supreme Court on a writ of error to the Supreme Court of Virginia, which fined the Western Union $200 for failure to forward promptly a message handed in for transmission to Brooklyn, N. Y. The opinion was brief, and held that the fact that the transaction was interstate did not deprive the state of Virginia, in the absence of a Federal statute, from legislating regarding it.

The United States circuit court of appeals, at St. Louis, March 29, upheld a temporary injunction against the corporation commission of Oklahoma granted by United States Judge Hook nearly a year ago, by which the state of Oklahoma is enjoined from enforcing the 2-cent passenger fare laws and a law reducing freight rates. The court upholds the law to be confiscatory and holds that section of the Oklahoma constitution establishing the corporation commission is invalid under the constitution of the United States. The decision was rendered on the interlocutory injunction which the railways had obtained and the petition for a permanent injunction will now be carried to the highest court. The decision says that the corporation commission of Oklahoma has no power to make rates, but it has power to exempt railways from confiscatory rates.

The New York State Court of Appeals has handed down a decision holding unconstitutional one of the two Employers' Liability Acts passed in 1910; that one under which employers of men in occupations defined in the law as dangerous, are required to make compensation to or in behalf of such employees in case of death or injury caused by or incident to their work, without regard to whether or not the employer is blameworthy. The court observes that on economical, philosophical or moral theories a law of this kind may be desirable; but to make an employer pay for injuries which are not due to any act or neglect on his part, and when he has disobeyed no law, violated no contract, and done no wrong, is a taking of property without due process of law, and therefore repugnant to both the federal and New York state constitutions. The other law, that abolishing the fellow-servant doctrine and modifying the rule of contribu-

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF JANUARY, 1911. (SEE ALSO ISSUES MARCH 17, 24 AND 31.)

Name of road.	Mileage operated at end of period.	Operating revenues			Operating expenses						Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
					Maintenance										
		Freight.	Passenger.	Total, inc. misc.	Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.					
Alabama & Vicksburg	143	$97,570	$42,254	$152,284	$23,238	$27,425	$3,767	$53,269	$5,526	$113,225	$39,059	$286	$4,490	$34,855	—$1,718
Buffalo & Susquehanna R. R.	265	124,820	7,951	139,275	26,303	36,266	1,980	57,800	6,043	128,391	10,884	.....	2,600	8,284	—
Buffalo & Susquehanna Ry	91	31,614	6,298	39,696	3,449	31,028	612	19,336	2,278	56,703	—17,007	—24	1,400	—18,431	—
Carolina, Clinchfield & Ohio	236	156,501	11,358	170,654	16,190	23,812	6,594	37,377	8,841	92,814	77,840	.....	5,500	72,340	34,638
Carolina, Clinchfield & Ohio of S. C.	18	9,629	2,090	11,898	615	148	894	2,464	720	4,841	7,057	.....	200	6,857	—
Central New England	277	214,169	23,475	252,506	37,701	27,856	2,396	88,641	3,547	160,141	92,365	.....	19,000	73,365	14,251
Chesapeake & Ohio of Indiana	285	104,865	13,214	124,806	35,865	36,702	4,872	86,401	5,607	169,447	—44,641	.....	3,790	—48,431	—
Chicago, Peoria & St. Louis	255	111,170	18,975	136,820	21,160	37,192	8,538	70,762	6,278	143,930	—7,110	.....	4,500	—11,610	—34,999
Chicago, Rock Island & Gulf	471*	178,381	60,462	255,198	21,608	26,261	11,716	101,594	8,681	169,860	85,338	—396	9,501	75,441	2,865
Cleveland, Akron & Columbus	212	137,645	41,932	196,321	31,130	45,152	2,599	76,053	5,007	159,941	36,380	.....	8,500	27,880	—10,335
Colorado Midland	338	99,406	22,771	139,995	15,498	32,649	4,742	72,427	5,534	130,850	9,145	—784	8,500	—139	—6,116
Cumberland Valley	162	175,205	46,857	232,944	22,043	30,568	4,584	83,541	6,382	147,118	85,826	199	5,141	80,884	4,174
Detroit, Grand Haven & Milwaukee	190	101,718	34,202	157,353	12,517	23,796	6,460	97,851	4,829	145,453	11,900	—67	3,009	8,824	—5,623
Evansville & Terre Haute	310	118,882	60,016	199,163	24,595	35,533	5,371	76,277	6,111	147,887	51,276	—593	9,410	41,273	—1,338
Gulf & Ship Island	307	132,325	30,896	176,675	23,206	30,758	1,652	48,670	8,798	113,084	63,591	.....	3,399	60,192	17,842
Kansas City, Mexico & Orient	740	114,228	29,014	154,343	31,531	34,975	7,824	74,413	7,751	156,494	—2,151	.....	6,750	—8,901	3,870
Louisiana & Arkansas	255	101,804	14,748	121,394	18,111	16,131	2,393	32,255	4,460	73,350	48,044	.....	2,825	45,219	12,479
Louisiana Ry. & Nav. Co	350	120,481	18,590	151,165	22,414	18,481	4,798	60,334	6,286	112,313	38,852	.....	4,400	34,452	17,708
Louisiana Western	207	113,827	62,738	184,909	50,655	26,915	5,895	59,138	7,832	150,435	34,474	—1,363	6,577	26,534	—27,917
Midland Valley	324	66,548	32,526	105,515	18,275	16,597	2,144	36,157	10,139	83,312	22,203	890	5,476	17,617	—393
Minneapolis, St. Paul & S. S. Marie	3,764†	1,098,396	369,497	1,587,743	154,823	267,966	42,555	716,594	44,175	1,226,113	361,630	—473	77,949	283,208	—425,812
Morgan's La. & Texas R. R. & S. S. Co.	405‡	323,822	110,753	467,047	61,560	57,067	10,252	154,529	13,275	296,683	170,364	—1,691	18,756	149,917	—2,839
Nevada Northern	165	111,539	9,534	124,177	5,524	15,740	605	29,928	3,051	54,848	69,329	.....	4,300	65,029	11,837
New Orleans & North Eastern	196	229,310	51,188	303,998	30,917	50,162	9,261	112,165	13,991	216,496	87,502	149	8,550	79,101	—7,080
New Orleans Great Northern	282	99,206	26,939	136,987	24,065	13,162	3,066	43,210	6,544	90,047	46,940	—103	2,200	44,637	—11,168
New Orleans, Mobile & Chicago	404	130,396	28,317	170,630	21,838	16,793	2,427	49,015	8,614	98,687	71,943	.....	4,256	67,687	12,641
New York, Philadelphia & Norfolk	112	186,338	30,112	239,611	29,840	42,553	3,483	101,016	11,377	188,269	51,342	.....	7,500	43,842	—9,140
New York, Susquehanna & Western	152	163,620	43,286	233,767	21,527	22,231	1,694	94,343	3,423	143,218	90,549	—739	11,771	78,039	31,505
Northwestern Pacific	376	75,507	96,738	192,957	48,494	39,404	3,109	91,725	9,431	192,164	793	.....	10,700	—9,906	—8,198
Pittsburg, Shawmut & Northern	240	111,150	7,673	120,903	11,957	35,236	1,039	48,830	4,339	101,401	19,502	.....	1,552	17,950	3,388
St. Joseph & Grand Island	319	93,445	32,270	137,761	19,848	21,751	6,517	63,312	7,041	118,469	19,292	—2	5,712	13,579	9,814
Santa Fe, Prescott & Phoenix	364§	93,768	35,555	137,142	25,416	14,146	2,831	45,415	5,375	93,184	43,959	.....	103	43,856	—8,954
Tennessee Central	294	79,116	27,517	113,339	15,083	13,199	4,622	40,981	10,080	83,965	29,374	.....	3,980	25,394	4,392
Vicksburg, Shreveport & Pacific	171	79,195	39,904	130,011	24,128	20,724	3,289	40,114	4,321	92,576	37,435	—96	6,175	31,164	9,417
West Jersey & Seashore	353	117,248	174,295	316,926	80,856	56,542	9,568	198,914	9,794	355,674	—38,748	—3,650	23,228	—65,626	9,168
Western Maryland	543	490,988	55,981	568,617	37,112	73,398	7,578	225,473	17,509	361,070	207,547	—729	19,500	187,318	—46,021
SEVEN MONTHS OF FISCAL YEAR 1911.															
Alabama & Vicksburg	143	$698,386	$312,512	$1,089,794	$142,281	$175,406	$26,309	$363,123	$37,221	$744,340	$345,454	$5	$32,936	$312,523	$20,106
Buffalo & Susquehanna R. R.	265	823,324	57,650	930,624	186,022	183,524	11,727	332,245	36,817	750,335	180,289	.....	16,271	164,019	—
Buffalo & Susquehanna Ry	91	351,316	73,449	443,335	52,130	199,785	5,615	182,118	21,635	461,283	—17,948	—24	11,729	—29,701	—
Carolina, Clinchfield & Ohio	236	824,850	99,369	951,659	92,681	132,636	38,456	210,199	57,712	531,684	419,975	549	38,500	382,024	200,511
Carolina, Clinchfield & Ohio of S. C.	18	45,709	10,749	58,269	4,277	456	6,388	16,457	3,801	31,379	26,890	.....	1,400	25,490	—
Central New England	277	1,549,306	218,001	1,862,987	379,802	162,202	14,194	546,984	21,278	1,124,460	738,527	.....	73,000	665,527	—15,235
Chesapeake & Ohio of Indiana	285	723,732	179,498	951,044	220,817	175,117	42,714	498,074	34,371	971,093	—20,049	.....	26,530	—46,579	—
Chicago, Peoria & St. Louis	255	836,285	195,578	1,083,403	164,622	229,222	51,276	487,860	40,564	973,544	109,859	.....	31,500	78,359	—121,988
Chicago, Rock Island & Gulf	471*	1,257,282	435,364	1,804,983	277,166	127,761	64,486	641,193	57,835	1,168,441	636,542	—2,236	39,174	595,132	—31,687
Cleveland, Akron & Columbus	212	1,164,573	358,942	1,628,540	296,261	261,536	21,639	541,038	28,665	1,149,139	479,401	.....	62,500	416,901	78,728
Colorado Midland	338	895,486	217,396	1,256,563	161,833	262,348	34,995	537,250	39,245	1,035,671	220,892	—2,686	57,883	160,323	—89,136
Cumberland Valley	162	1,385,946	399,892	1,869,460	216,126	247,603	34,406	582,496	46,673	1,127,304	742,156	2,111	39,024	705,243	—13,735
Detroit, Grand Haven & Milwaukee	190	687,822	353,731	1,206,124	171,090	146,409	44,077	581,111	31,617	974,304	231,820	—240	21,063	210,517	—98,462
Evansville & Terre Haute	310	1,046,469	440,807	1,638,234	204,124	229,294	38,890	524,387	45,207	1,041,902	596,332	—5,430	65,870	525,032	4,793
Gulf & Ship Island	307	853,595	254,370	1,189,251	145,320	203,862	11,950	332,522	55,867	749,521	439,730	.....	34,764	404,966	53,190
Kansas City, Mexico & Orient	740	834,777	274,426	1,174,005	226,668	234,466	54,292	526,717	54,458	1,096,601	77,404	.....	32,026	45,378	—49,790
Louisiana & Arkansas	255	694,974	116,358	844,429	136,915	116,968	17,294	224,012	31,392	526,581	317,848	.....	18,575	299,273	35,515
Louisiana Ry. & Nav. Co	350	786,163	144,714	1,021,896	179,179	119,909	34,692	415,029	43,575	792,384	229,512	.....	30,800	198,712	79,300
Louisiana Western	207	792,920	384,774	1,235,722	163,886	174,208	43,252	363,618	51,921	796,885	438,837	—832	49,949	388,056	—56,268
Midland Valley	324	499,401	239,753	783,295	140,875	120,499	15,135	224,509	51,488	552,506	230,789	7,789	38,328	200,250	10,237
Minneapolis, St. Paul & S. S. Marie	3,764†	9,238,517	3,109,949	13,202,819	1,349,962	1,825,993	304,782	4,766,959	284,899	8,532,595	4,670,224	92,682	727,531	4,035,375	—1,988,351
Morgan's La. & Texas R. R. & S. S. Co.	405‡	2,304,339	706,615	3,196,374	404,700	358,830	76,867	1,070,239	93,971	2,004,607	1,191,767	—12,209	137,989	1,041,569	27,463
Nevada Northern	165	769,214	82,927	879,802	47,468	91,967	2,539	185,999	25,397	353,370	526,432	.....	30,307	496,125	—10,883
New Orleans & North Eastern	196	1,615,201	370,713	2,119,353	211,715	318,108	64,636	746,971	81,037	1,422,467	696,886	—311	61,337	635,238	33,279
New Orleans Great Northern	282	667,297	223,341	973,952	150,556	134,569	21,702	271,511	34,899	613,237	360,715	—582	13,150	346,983	66,726
New Orleans, Mobile & Chicago	404	804,986	205,768	1,083,460	147,434	89,447	19,951	316,804	56,103	629,739	453,721	.....	30,832	422,889	83,340
New York, Philadelphia & Norfolk	112	1,603,021	260,222	2,013,649	217,590	329,583	32,323	764,085	77,779	1,421,360	592,289	.....	54,150	538,139	—61,735
New York, Susquehanna & Western	152	1,156,194	362,574	1,707,314	207,456	159,391	14,385	631,228	30,239	1,042,699	664,615	2,750	81,944	585,421	109,202
Northwestern Pacific	376	883,580	1,041,560	2,076,498	357,633	289,699	19,892	746,682	64,389	1,478,295	598,203	.....	73,900	524,303	—20,908
Pittsburg, Shawmut & Northern	240	777,485	65,712	856,595	132,726	216,762	8,503	309,977	32,171	700,139	156,457	.....	10,979	145,477	—2,098
St. Joseph & Grand Island	319	689,185	283,879	1,057,313	231,253	141,908	45,803	447,079	43,256	909,299	148,014	273	41,902	106,385	—47,738
Santa Fe, Prescott & Phoenix	364§	671,033	254,684	988,208	173,616	94,170	19,240	313,044	39,708	639,778	348,430	.....	741	347,689	—24,340
Tennessee Central	294	590,515	242,873	883,975	126,430	89,413	34,279	268,673	57,644	576,440	307,534	.....	27,861	279,674	13,807
Vicksburg, Shreveport & Pacific	171	552,945	305,842	927,508	134,032	152,298	23,618	277,236	31,713	618,897	308,611	—375	41,025	267,211	60,524
West Jersey & Seashore	353	1,098,006	2,532,807	3,874,107	582,647	469,506	120,003	1,561,472	75,449	2,809,077	1,065,029	—43,198	159,863	861,966	30,231
Western Maryland	543	3,525,377	635,770	4,344,708	512,960	516,018	67,010	1,500,943	93,050	2,689,981	1,654,727	—2,450	136,500	1,515,777	—

Mileage on January 31, 1910—* 530 miles; † 3,525 miles; ‡ 3,525 miles; § 257 miles; — indicates Deficits, Losses and Decreases.

tory negligence, and otherwise favoring the employee, is not touched by this decision. The court says that the legislature has the power to make these changes. It is proper also to classify certain occupations as dangerous; but the law now condemned goes farther. The right of property does not rest on philosophical speculations or benevolence; nor on charity, or even upon the dictates of natural justice, but rather in the written constitution and laws; and these can be changed only by changing the constitution (which in this case would mean the constitutions of both the state of New York and of the United States). Their other law passed at the same time, not confined to dangerous occupations, provides for the voluntary payment of compensation by employers to employees; the matter to be arranged by contract; but from the operation of this contract clause of the law railways are excepted.

Commodities Clause Decision.

The "commodities clause" of the rate law of 1906, which was the subject of a decision by the Supreme Court of the United States two years ago has been further considered by that court, and this week, in a decision by Chief Justice White, it is held that the lower court had erred in refusing to allow the government to amend its original petition Justice White referred to the refusal as "an absolute abuse of discretion." He said, however, that the abuse was "obviously occasioned by a misconception of the character of the action of this court and the scope of the mandate."

"While that decision expressly held," said the chief justice, in referring to the holding of the Supreme Court two years ago, "that stock ownership by a railroad company in a bona fide corporation, irrespective of the extent of such ownership, did not preclude a railroad company from transporting the commodity manufactured, mined, produced or owned by such corporation, nothing in that conclusion foreclosed the right of the government to question the power of the railroad company to transport in interstate commerce a commodity manufactured, mined, owned or produced by a corporation in which the railroad held stock and where the power of the railroad company as a stockholder was used to obliterate all distinctions between the two corporations. That is to say, where the power was exerted so as to commingle the affairs of both, as by necessary effect to make such affairs practically undistinguishable, and therefore to cause both corporations to be one for all purposes.

"It must be held that while the right of a railroad company as a stockholder to use its stock ownership for the purpose of a bona fide separate administration of the affairs of a corporation in which it has a stock interest may not be denied, the use of such stock ownership in substance for the purpose of destroying the entity of a producing, etc., corporation and of commingling its affairs in administration with the affairs of the railroad company so as to make the two corporations virtually one, brings the railroad company so voluntarily acting as to such producing, etc., corporation within the prohibition of the commodities clause. In other words, that by operation and effect of the commodities clause, there is a duty cast upon a railroad company purposing to carry in interstate commerce a product of the producing, etc., corporation in which it has a stock interest, not to abuse such power so as virtually to do by indirection that which the commodities clause prohibits, a duty which plainly would be violated by the unnecessary commingling of the affairs of the producing company with its own so as to cause them to be one and inseparable."

The opinion reverses the decree of the Circuit Court for the Eastern district of Pennsylvania in the case of the United States, appellant, against the Lehigh Valley Railroad Company. The lower court erred in refusing to permit the Government to file an amended bill.

As the result of the present opinion it is expected that the Government will at once file its amended bill against the Lehigh Valley alleging that the ownership by the carriers of the Lehigh Valley Coal Company is a violation of the commodities clause and that the cause will proceed to a hearing on this issue. Furthermore it is believed that the Department of Justice will promptly enter upon a searching investigation of the relations of all the anthracite railroads to determine just how far their relations with coal producing companies are in violation of laws.

Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

F. D. Blue has been appointed claim agent of the New Orleans Great Northern, with office at Bogalusa, La.

W. G. Brimson, formerly vice-president of the Quincy, Omaha & Kansas City, at Kansas City, Mo., has been elected president of the Texas City Terminal, with office at Texas City, Mex.

W. O. Wall, freight claim agent of the Macon, Dublin & Savannah, at Macon, Ga., has been appointed general claim agent, and the positions of freight claim agent and claim agent have been abolished.

E. A. Weber, cashier and office manager of Peabody, Houghteling & Company, Chicago, has been appointed treasurer and auditor of the National Railroad of Hayti, with office at Port Au-Prince, Hayti.

C. C. Barry has been appointed auditor of the Houston & Texas Central and the Houston East & West Texas, with office at Houston, Tex., succeeding W. C. Parker, resigned to take a position in the office of the general auditor of the Harriman Lines at Chicago.

Carl R. Gray, senior vice-president of the St. Louis & San Francisco, and vice-president of the St. Louis, Brownsville & Mexico and other Frisco lines, at St. Louis, Mo., has been elected president of the Spokane, Portland & Seattle, the Oregon Trunk Railway, the Oregon Electric Railway, the Astoria & Columbia River, the Pacific & Eastern and the United Railways Company, with office at Portland, Ore., succeeding John F. Stevens, resigned.

Frank V. Whiting, general claim agent of the New York Central & Hudson River, has been appointed general claims attorney of the New York Central Lines, except the Boston & Albany. Harry H. Downs has been appointed chief claim agent and Willis H. Failing, assistant chief claim agent of the New York Central & Hudson River, and leased and operated lines east of Buffalo, N. Y., except the Boston & Albany, all with offices at New York. The following chief claim agents have been appointed on various New York Central Lines west of Buffalo: Frank A. Hruska, Cleveland, Ohio; Charles H. Myers, Indianapolis, Ind.; William H. McGarr, Detroit, Mich., and Charles A. Theiss, Chicago.

W. C. Nixon, vice-president and general manager of the St. Louis & San Francisco, and vice-president of other Frisco Lines at St. Louis, Mo., has been elected vice-president, in charge of maintenance and operation, with office at St. Louis, succeeding Carl R. Gray, resigned to become president of the Spokane, Portland & Seattle. W. T. Tyler, general superintendent of the First district at Springfield, Mo., has been appointed general manager, with office at Springfield, succeeding Mr. Nixon. J. A. Frates, superintendent of the Third district, at Chaffee, Mo., has been appointed general superintendent of the First district, with office at Springfield, succeeding W. T. Tyler, and E. D. Levy, superintendent of transportation, at Springfield, has been appointed assistant general manager, with office at Springfield.

Operating Officers.

W. E. Becker has been appointed a trainmaster of the Chicago, Milwaukee & Gary, with office at Rockford, Ill.

A. B. Kearsey, auditor of the Atlanta & St. Andrews Bay, at Dothan, Ala., has been appointed trainmaster. W. T. Steger succeeds Mr. Kearsey.

J. F. Carten, assistant superintendent of the Pullman Company, at Salt Lake City, Utah, has been appointed assistant district superintendent, at St. Louis, Mo.

Frank M. Gates has been appointed car accountant of the Minneapolis, St. Paul & Sault Ste. Marie, with office at Minneapolis, Minn., succeeding B. R. Lewis, resigned.

John Ryan has been appointed superintendent of the fuel department of the Missouri, Kansas & Texas, with office at Pittsburgh, Kan., succeeding John Jopling, deceased.

The jurisdiction of J. E. Hutchinson, general superintendent of the Second district of the St. Louis & San Francisco, will be extended to cover the Third district, effective May 1.

J. H. Franke has been appointed superintendent of the Peoria Railway Terminal Company, with office at South Bartonville, Ill., and the offices of trainmaster and master mechanic have been abolished.

W. H. Wright, superintendent of the Central of Georgia, at Savannah, Ga., having been granted 90 days' leave of absence, D. F. Kirkland has been appointed acting superintendent, with office at Savannah.

E. Thomason, general manager of the Durham & Charlotte, at Durham, N. C., having resigned to go to another company, his position has been abolished, and all correspondence should in future be addressed to J. E. Stagg, vice-president, at Durham.

C. E. McMullin, superintendent of the terminal division of the Northern Pacific at Seattle, Wash., has been appointed superintendent of terminals at Tacoma, Wash., a new office, the yards at Tacoma having been taken out of the Tacoma division to form a separate terminal division.

The statement made in our issue of March 31, that L. C. Badgley, trainmaster of the Chicago & Alton at Peoria, Ill., had resigned and that the jurisdiction of S. P. Henderson, trainmaster at Bloomington, Ill., had been extended to include the Dwight and Rutland branches, was incorrect.

Thomas P. McMahon, who was appointed assistant superintendent of the Buffalo, Rochester & Pittsburgh, at Du Bois, Pa., was born May 18, 1870, at St. Mary's, Pa. He began railway work on the Buffalo, Rochester & Pittsburgh September 8, 1888, as a telegraph operator, and in February, 1891, was promoted to copier in the despatcher's office at Bradford, Pa. In January of the following year he was appointed despatcher and in April, 1901, he was made chief despatcher. Mr. McMahon was promoted to trainmaster in October, 1906, which position he held at the time of his recent appointment as assistant superintendent.

C. J. Phillips, superintendent of the Buffalo division of the Delaware, Lackawanna & Western, at Buffalo, N. Y., has been appointed superintendent of the Morris & Essex division, with office at Hoboken, N. J., succeeding to the duties of S. S. Stone, acting superintendent, resigned. George A. Poore, superintendent of the Syracuse and Utica divisions, at Syracuse, N. Y., succeeds Mr. Phillips. Frank Cizek, superintendent of the Bangor & Portland division, at Easton, Pa., succeeds Mr. Poore. J. J. McCann, trainmaster at Scranton, has been appointed superintendent of the Scranton division, with temporary jurisdiction over the Bangor & Portland division, with office at Scranton.

P. Fraser, assistant superintendent of the Buffalo, Rochester & Pittsburgh, at Du Bois, Pa., has been appointed superintendent of the Middle and Pittsburgh divisions, with office at Du Bois, succeeding A. J. Johnson, assigned to special duties. A. B. White, trainmaster at Punxsutawney, has been appointed assistant superintendent, with office at Punxsutawney. T. P. McMahon, trainmaster at Du Bois, succeeds Mr. Fraser, and G. W. Bennett succeeds Mr. McMahon. M. G. McInerney, trainmaster at East Salamanca, N. Y., has been appointed assistant superintendent of the Buffalo and Rochester divisions, with office at East Salamanca, and R. G. Matthews has been appointed terminal superintendent at Rochester.

Miles Bronson, superintendent of the Mohawk division of the New York Central & Hudson River, at Albany, N. Y., has been appointed superintendent of the Electric division, at New York, succeeding C. L. Bardo, whose resignation has already been announced in these columns. A portrait of Mr. Bronson and a sketch of his railway career were published in the *Railway Age Gazette* of January 14, 1910, page 110. D. W. Dinan, superintendent of the Pennsylvania division, at Corning, succeeds Mr. Bronson, and F. E. McCormack, superintendent of the Rochester division, at Rochester, succeeds Mr. Dinan. A portrait of Mr. McCormack and a sketch of his railway career were published in the *Railway Age Gazette* of June 24, 1910, page 1811. S. J. Kearns, superintendent of the Ontario division at Oswego, succeeds Mr. McCormack, and J. W. Evans, assistant superintendent at Jersey Shore, Pa., succeeds Mr. Kearns.

R. G. Stanfield, whose appointment as superintendent of the Macon & Birmingham, has been announced in these columns, was born October 4, 1864, at Americus, Ga., and was educated in the common schools. He began railway work October 8, 1882, as a telegraph operator on the East Tennessee, Virginia & Georgia, now a part of the Southern Railway, and was appointed train despatcher at Atlanta in November, 1884. The following July, he was appointed agent at Jackson, resigning from that position in August, 1898, to go to the auditor's office of the Georgia, Southern & Florida, at Macon. For a short time in 1899 he was acting traveling auditor, and on January 1, 1900, was made chief clerk to the local agent at Macon. In April of the following year he was appointed local agent at Cordele, which position he held at the time of his recent appointment as superintendent of the Macon & Birmingham, at Macon.

Traffic Officers.

C. W. Browder has been appointed a traveling freight agent of the Illinois Southern, with office at St. Louis, Mo.

J. C. Kimes has been appointed commercial freight agent of the Baltimore & Ohio, with office at Pittsburgh, Pa.

A. W. Northrup has been appointed a soliciting freight agent of the Northern Pacific, with office at Winnipeg, Man.

Charles Hamilton has been appointed a traveling passenger agent of the Wabash Railroad, with office at Pittsburgh, Pa.

W. D. Nelson has been appointed a commercial agent of the Macon, Dublin & Savannah, with office at Jacksonville, Fla.

L. J. Blaker, commercial agent of the Cleveland, Cincinnati, Chicago & St. Louis, with office at Indianapolis, Ind., has resigned to engage in other business.

Frank N. Dowler, city freight agent of the Delaware, Lackawanna & Western, at New York, has been appointed general eastern agent of the Colorado Midland, with office at New York.

Edward J. Sawyer has been appointed division passenger agent of the Northern division and branches of the Chicago Great Western, with office at St. Paul, Minn., succeeding Charles A. Doherty, resigned.

A. L. Armstrong has been appointed a commercial agent of the Minneapolis & St. Louis and the Iowa Central, with office at Cleveland, Ohio, succeeding C. D. Fortney, resigned to accept service with another company.

Frank J. Howell, traveling freight agent of the Norfolk & Western at Toledo, Ohio, has been appointed a freight solicitor of the Union Line of the Pennsylvania Lines west of Pittsburgh, with office at Detroit, Mich.

Lewis Snodgrass, traveling freight agent of the Delaware & Hudson at Pittsburgh, Pa., has been appointed a commercial agent, with office at St. Louis, Mo., where an agency was established on April 1. J. P. Stewart succeeds Mr. Snodgrass at Pittsburgh.

C. A. Talley, soliciting freight agent of the St. Louis & San Francisco, at Oklahoma City, Okla., has been appointed traveling freight agent, with office at Oklahoma City, succeeding M. G. Buffington, promoted. L. E. Moeller succeeds Mr. Talley.

John R. Brophy has been appointed a commercial agent of the Carolina Despatch, operating over the Atlantic Coast Line, the Norfolk & Western and the Winston-Salem Southbound, with office at Cincinnati, Ohio, and W. A. Cooper has been appointed commercial agent, with office at Charleston, S. C.

Perritt A. Marr, traveling passenger agent of the Illinois Central, at Cleveland, Ohio, has been appointed district passenger agent, with office at Pittsburgh, Pa. J. F. Merry has been appointed general agent, with office at Manchester, Iowa. John C. Clair, industrial commissioner of the Illinois Central, Indianapolis Southern and Yazoo & Mississippi Valley, has been appointed industrial and immigration commissioner, with office at Chicago.

J. P. McBride, traveling freight agent of the Louisville & Nashville, at Knoxville, Tenn., has been appointed general agent, at Knoxville, succeeding G. W. Fuget, resigned. B. W. Strain succeeds Mr. McBride. L. A. Dwelle, traveling freight agent at Louisville, Ky., has been transferred to Jacksonville, Fla., succeeding Willis Calloway, resigned, and F. A. McHale succeeds Mr. Dwelle. William G. Marshall has been appointed a traveling claim agent, with office at Montgomery, Ala., succeeding B. W. Strain, promoted.

L. D. Heusner, general western passenger agent of the Lake Shore & Michigan Southern, the Dunkirk, Allegheny Valley & Pittsburgh and the Lake Erie, Alliance & Wheeling at Chicago, has been appointed assistant general passenger agent of the Michigan Central, with office at Detroit, Mich., succeeding J. S. Hall promoted. I. P. Spining, general agent of the Cleveland, Cincinnati, Chicago & St. Louis and the Michigan Central at Chicago, has been appointed also general western passenger agent of the Lake Shore and the other lines mentioned above, succeeding Mr. Heusner.

Engineering and Rolling Stock Officers.

George Worling has been appointed master mechanic of the Gainesville Midland, with office at Gainesville, Ga.

N. Kirby has been appointed master mechanic of the Alabama, Tennessee & Northern, with office at Panola, Ala., succeeding D. D. Briggs.

A. C. Everham has been appointed assistant chief engineer of the Kansas City Terminal Railway, with office at Kansas City, Mo., a new office.

C. E. Knickerbocker, superintendent of maintenance of way of the New York, Ontario & Western, at Middletown, N. Y., has been appointed chief engineer, in charge of the road department, reporting to the general superintendent.

G. T. Hand, terminal engineer of the Delaware, Lackawanna & Western, at Hoboken, N. J., has been appointed division engineer, in addition to his former duties, he will assume the duties of E. I. Cantine, division engineer, at Hoboken, resigned. D. Harley, roadmaster of the Utica division, at Utica, N. Y., has been transferred to the Syracuse division, with office at Syracuse, succeeding R. C. Scofield, who succeeds Mr. Harley on the Utica division.

Purchasing Officers.

J. L. White, purchasing and supply agent of the St. Louis, Brownsville & Mexico at Kingsville, Tex., has had his headquarters removed to Houston, Tex., and his jurisdiction has been extended to include the St. Louis & San Francisco lines in Texas.

OBITUARY.

J. C. Bailey, general superintendent of the Utah lines of the Denver & Rio Grande, with office at Salt Lake City, Utah, died at Salt Lake City on April 4.

John A. Scott, general passenger agent of the Southern lines of the Illinois Central, with office at Memphis, Tenn., died at Memphis on April 1. Photograph of Mr. Scott and a sketch of his railway life were published in the *Railway Age Gazette* of March 17, page 523, shortly after his appointment to the above office.

David Brown, assistant superintendent of motive power and equipment of the Delaware, Lackawanna & Western, at Scranton, Pa., died on April 2. Mr. Brown was born May 17, 1838, in Canada, and began railway work in 1851 as messenger boy on the Monmouthshire Railway & Canal Co., at Newport, Monmouthshire, England. From August, 1870, to January, 1872, he was a machinist on the Delaware, Lackawanna & Western, at Scranton, Pa., and was then appointed gang foreman. In 1886 he was appointed general foreman and four years later was appointed assistant master mechanic. He was promoted to master mechanic in 1891, and was later made assistant superintendent motive power of the same road.

Spencer Meade, superintendent of the Pennsylvania Railroad Voluntary Relief Department, died April 4 at his home in Philadelphia, Pa. Mr. Meade was born in Philadelphia January 19, 1850. He was graduated as civil engineer from the Polytechnic College, state of Pennsylvania in the class of '69, and began railway work in the engineering department of the Allegheny Valley in August of the same year. He held various positions in the engineering department of the Pennsylvania Railroad and at the time of his appointment as superintendent of the relief department in July, 1900 he was superintendent of the Elmira and Canandaigua divisions of the Northern Central.

Railway Construction.

New Incorporations, Surveys, Etc.

ATCHISON, TOPEKA & SANTA FE.—According to press reports, surveys are being made to build a line around Pueblo, Colo. The new line is to carry freight around the city instead of passing through the business section.

BEAUMONT & GREAT NORTHERN.—Announcement is made that the Weldon extension will be opened for freight and passenger traffic from Trinity, Tex., to Weldon, 15.2 miles, on April 10.

BOSTON & MAINE.—The House of Representatives of the New Hampshire legislature has passed the bill permitting the Connecticut River Railroad, which is leased by the Boston & Maine, to extend its line from Hinsdale, N. H., to Walpole, on the New Hampshire side of the Connecticut river.

CALIFORNIA ROADS.—W. F. Holt, Redlands, Cal., is said to have bought land in the Palo Verde valley, and a company will be organized at once to build an 85-mile railway to connect with the main line of the Southern Pacific in Imperial Valley, Cal. Surveys are now being made.

G. D. Armstead, Escondido, Cal., is said to be back of a project to build a line from San Bernardino, south to San Diego, about 100 miles. Right-of-way has been secured from San Bernardino to Fall Brook.

The Afterthought Copper Company, Ingot, Shasta county, Cal., will soon start work on a line from Ingot, southwest to Bella Vista, 14 miles.

CALIFORNIA ROADS (Electric).—The Monterey County Gas & Electric Company, Salinas, Cal., has applied for a franchise to build from Monterey, northeast to Castroville, about 20 miles.

CANADIAN NORTHERN.—A contract is said to have been given to Foley, Welch & Stewart, St. Paul, Minn., for building from Port Arthur, Ont., east.

CONNECTICUT RIVER RAILROAD.—See Boston & Maine.

DEERING SOUTHWESTERN.—Trains are now in operation between Caruthersville, Mo., and Converse.

FORE RIVER SHORE LINE.—Organized in Maine to build from a point near Deering Junction, Me., to and along the South Portland water front of Portland harbor. W. F. Spear, president, South Portland; W. W. Thomas, treasurer, Portland.

GARY & SOUTHERN TRACTION.—It is understood that this company can now build its line from Gary, Ind., south about 15 miles to Crown Point, a suit having recently been decided by the courts in its favor regarding the right-of-way. It is expected to have the line ready for operation in July of this year.

GEORGIA & FLORIDA.—This company has absorbed the Sparks Western, which has been extended from Pineboro, Ga., to Moultrie, 7 miles. A branch line is under construction from Sparks to Adel, and it is expected that this work will be finished about May 1. (March 10, p. 478.)

GEORGIA, MIDLAND & GULF.—Plans are being made to build from Athens, Ga., south via Milledgeville to Dublin, about 120 miles, thence south to the gulf of Mexico. J. R. Crandall, Midville, and J. O. Hall, Toomsboro, are interested.

GLENDALE-EAGLE ROCK (Electric).—This company, it is said, will extend its line through the La Crescenta (Cal.) and Sunland districts to Monte Vista, seven miles.

GRAND TRUNK PACIFIC.—Surveys are being made for a line from Lethbridge, Alb., south to the international boundary at Coutts. It is understood that the line is to be extended eventually to Minneapolis, Minn.

GREAT NORTHERN.—According to press reports, work is to be started in June on the Midland of Manitoba, from Winnipeg, Man., south to the international boundary; also on terminals to be built at Winnipeg.

GREENVILLE, SPARTANBURG & ANDERSON.—See Piedmont & Northern (Electric).

HENDERSON INTERURBAN.—Surveys are being made by H. U. Wallace & Co., Marquette building, Chicago, for interurban lines

to be built by this company, connecting Henderson, Ky., with Owensboro, Uniontown, Morganfield, Sebree, Dixon and Providence.

LOCK HAVEN & JERSEY SHORE (Electric).—An officer writes that contracts will be let in about two months to build from Lock Haven, Pa., northeast to Jersey Shore. There will be one steel bridge, 500 ft. long on the line, also a large power plant at North Fork. L. M. Patterson, president and George Roberts, chief engineer, both of Lock Haven. (March 10, p. 479.)

MAINE CENTRAL.—The Maine railway commissioners have authorized the construction of seven miles of new line from a point two miles east of Cumberland Junction, Me., to a point about eight miles northeast of Cumberland Junction. The new line is to have double-track, and is being built to avoid the Walnut Hill grade. It is expected to have the improvements finished by June. (February 17, p. 334.)

MANISTIQUE & LAKE SUPERIOR.—The McNeill branch has been opened for business from Scott's, Mich., to Doyle.

MEXICAN UNION.—An officer writes that this company's plans call for a line from Torres, Sonora, Mexico, via La Colorado, Represo, Tecolote, Pueblo, Diezo and San Raphael to Ures, a total of about 65 miles. Contracts for the work have been let to Henrique Cubillas, Hermosillo, and track has been laid for over six miles. The work will be easy, the approximate cut and fill per mile will be 5,000 cu. yds. The line is to have maximum grades of 2.5 per cent., and maximum curvature of 6 deg. The company now owns and operates the Torres, Prietas & Represo, and has 12 miles in operation from Torres, east to Minas Prietas.

MIDLAND OF MANITOBA.—See Great Northern.

MIDLAND VALLEY.—An officer writes that a contract has been given to M. Tansey, San Saba, Texas, to build the Wichita & Midland Valley from Arkansas City, Kan., northwest to Wichita, 55 miles, and work is now under way. (February 24, p. 368.)

MUSCATINE NORTH & SOUTH.—Train service has been extended from Oakville, Iowa, to Kingston, 10 miles.

NEW BRUNSWICK COAL & RAILWAY.—This company, which operates a line from Norton, N. B., to Minto, 58 miles through the coal fields of Queen county, is seeking permission to build an extension from Minto to Frederickton, 31 miles.

NORTH CAROLINA ROADS.—Boston, Mass., and other northern capitalists are back of a project to build from Winston-Salem, N. C., southeast to Cameron, about 75 miles.

OHIO ROADS (Electric).—Plans are being made to build a line from Warren, Trumbull county, Ohio, north to the Ashtabula county line, about 20 miles. Henry Orth has applied to the county commissioners at Warren for a franchise to build the line.

OREGON SHORT LINE.—On the Montana division the Aberdeen branch has been opened for business from Moreland Junction, Idaho, southwest to Aberdeen, 28.2 miles.

OREGON-WASHINGTON RAILROAD & NAVIGATION CO.—The Yakima division has been opened for traffic from Attalia, Wash., northwest to North Yakima, 98 miles.

PACIFIC COAST RAILWAY.—Trains are now being operated over the Suey branch between Suey Junction, Cal., and Sisquoc.

PENNSYLVANIA RAILROAD.—The Hillman branch of the Bellwood division from Hillman, Pa., to Madeira, 6 miles, is now open for passenger service.

PEOPLE'S ELECTRIC.—An officer writes that contracts are now being let to build from Muskogee, Okla., via Fort Gibson, Wagoner, Claremore, Tulsa, Bartlesville, Sapulpa and Shawnee, to Oklahoma City. G. W. Risser, president, Oklahoma City.

PIEDMONT & NORTHERN (Electric).—According to press reports a contract has been given to W. J. Oliver, Knoxville, Tenn., to build the Greenville, Spartanburg & Anderson, which was organized to build a line to connect Greenwood, S. C., and Charlotte, N. C. J. B. Duke, Somerville, N. J., and B. N. Duke, Fifth avenue, New York, are interested. (February 10, p. 301.)

ROCK ISLAND, TEXAS & GULF.—An officer writes that this company has not yet been chartered. Contracts will be let in about 30 days to build from a connection with the Atchison, Topeka & Santa Fe in Parmer county, Texas, south via Knowles, N. M., thence southeast to Midland, Texas, about 200 miles. The line is eventually to be extended to Kerrville, and will be built to carry lumber, coal, live stock and merchandise. The company would like to hear from contractors in a position to carry out the work, which will be light. M. J. Healy, president, Amarillo.

SAN BENITO & RIO GRANDE VALLEY.—An officer writes that this line is to be built to Santa Maria, Texas, which is about 25 miles from San Benito. Track has been laid on 10 miles, and rails have been bought for 13 miles additional. The Hidalgo Construction Company, San Benito, has the general contract. The work is light, involving the handling of about 8,000 cu. yds. a mile. The line is being built to develop the lands of the San Benito Land & Water Company and adjacent properties. Steam will be used as the motive power for handling freight, which will consist of sugar cane, cotton, winter vegetables and fruit, and gasolene motor cars will be used for passenger service. S. A. Robertson, trustee, and C. E. Ensminger, chief engineer, San Benito.

SHELBY NORTHWESTERN.—Incorporated in Missouri with $225,000 capital, to build from Shelbyville, Mo., to the northern part of Shelby county, 15 miles. The incorporators include: H. M. Houck, J. A. Hope, J. H. Byrd, G. L. Houck, G. Houck and J. A. Flapek.

SIERRA RAILWAY COMPANY OF CALIFORNIA.—The Southern Pacific is said to have secured control of this company, and it is understood will rebuild the road which is now in operation between Oakdale, Cal., and Angels, 60 miles.

SOUTHERN PACIFIC.—See Sierra Railway Company of California.

SOUTHERN RAILWAY.—Extensive improvements on the line between Atlanta, Ga., and Macon, involving the laying of about 20 miles of passing tracks and revision of grades are to be made at once by this company. The passing tracks will be of the lap-sidings design, which greatly facilitates the movement of trains. These tracks will be placed at intervals of about five miles, and each will be long enough to accommodate four trains. During the last few months the Southern has completed the work of strengthening the bridges on this line and is now operating its heaviest locomotives over it.

SOUTHWESTERN RAILWAY.—This company, which now operates a 30-mile line from Henrietta, Texas, to Archer City, will probably start work within the next 90 days on an extension.

SOUTHERN TRACTION.—Organized in Texas with office at Dallas, Texas, to build from Dallas, south to Waco, 100 miles, with a branch from Waxahachie, via Ennis to Corsicana, 30 miles. Contract for making the surveys and other engineering work has been let to the Fred A. Jones Engineering Company, Dallas. J. F. Strickland, president, Dallas, is also president of the Texas Traction Company.

SPARKS WESTERN.—See Georgia & Florida.

ST. LOUIS, IRON MOUNTAIN & SOUTHERN.—The Cairo branch of the Illinois division has been opened for business from Thebes Junction, Ill., south to Cairo, 24 miles.

TEXAS CENTRAL.—According to press reports, this company has amended its charter so that it can build an extension to complete the line from De Leon, Comanche county, Texas, northwest to Nolan. The line is now in operation from De Leon to Cross Plains, 40 miles.

TEXAS ROADS (Electric).—The Commercial Club of Belton, Texas, is back of a project to build an interurban line from Belton to Holland, 16 miles.

TORRES, PRIETAS & REPRESO.—See Mexican Union.

VERA CRUZ, TABASCO & CAMPECHE.—An officer writes that preliminary surveys have just been started on this line. The projected route is from Santa Lucrecia, Mexico, on the Tehuantepec National, east to Campeche, on the United Railways of Yucatan, 490 miles. Donato de Chapeaurouge, president; A. L. Van Antwerp, secretary, and David Coe, chief engineer, Mexico City.

WICHITA & MIDLAND VALLEY.—See Midland Valley.

Railway Financial News.

Arkansas, Oklahoma & Western.—See Kansas City & Memphis.

Bartlett & Florence.—This property is to be sold at public auction at Georgetown, Texas, on May 29 under order of the district court. The road runs from Bartlett, Texas, to Jarral, 12 miles.

Canadian Pacific Railway.—Directors of the company have formulated a plan whereby shareholders in the future may receive greater advantages from the extraneous assets of the company. Among the securities held by the company are bonds and stocks of a face value of $46,000,000, on which the company receives interest or dividends; that land mortgages and cash proceeds of land sales total $50,000,000; that there are other land values conservatively estimated at $6,500,000, consisting of land obtained by the company in connection with the acquisition of branch line railways; and that besides these there are the unsold lands in the agricultural district, approximating 7,300,000 acres.

It is proposed in view of the practice heretofore observed by the company in separating in the annual report the revenue from land sales from the other income, to adopt the same policy with reference to interest on investments, dividends, rentals and other sources of income other than from railway and steamship operations, incorporating the income from these items in one fund from which the directors will make such periodical distribution as may be warranted by circumstances, in addition to the regular dividends that may be declared on the common stock of the company.

It is estimated that interest and dividend return from these sources will be about $4,500,000 during the current year. The above, with a comparatively small contribution from the land funds, represents 3 per cent. on the common stock, and therefore it was decided to make a distribution on that basis.

Chesapeake & Ohio.—Frank Trumbull, chairman of the board of directors, in a circular in regard to the new $125,000,000 bonds to be authorized by the stockholders, says in part:

"In considering their duty to you and to the public, in connection with future requirements, the directors think it best to avoid further divisional mortgages, and to provide a comprehensive mortgage which will furnish a unified and convenient medium for financing; one which will enable the company from time to time to take advantage promptly of favorable money market conditions.

"In order to provide the means to pay for additional yards, terminals, equipment and other additions, improvements, and betterments, and to acquire or construct branch or connecting lines, also to retire certain equipment and other obligations (including $11,000,000 general funding and improvement mortgage bonds, which mature prior to the maturity of the proposed mortgage, and may be redeemed upon due notice at any time in the discretion of the directors), and for other corporate purposes, the directors recommend the creation of a mortgage under which bonds may be issued, limited to $125,000,000, to mature in twenty years, and to bear such rate of interest, not exceeding 5 per cent., as the directors or executive committee may from time to time determine. It is proposed that the mortgage be made a first lien upon certain securities now held in the treasury of your company, including all bonds and stock of the Chesapeake & Ohio Railway Company of Indiana, which owns 261.7 miles of road; a general lien (subject to prior liens and upon a parity, respecting lines of railway owned on April 28, 1910, with the convertible bonds under the company's trust indenture of that date) upon the railways, equipment, and franchises now owned by your company; and become a lien upon any property acquired by the use of bonds issued thereunder."

Chicago, St. Paul, Minneapolis & Omaha.—Rhoades & Co., New York, are offering $1,500,000 Superior Short Line first mortgage 5 per cent. bonds of 1895-1930 at 109⅛, yielding about 4.30 per cent. income.

Cincinnati, Chicago & Louisville.—The receiver of this company, whose property was sold under foreclosure to the Chesapeake & Ohio, has been finally discharged.

Delaware & Eastern.—The trustee of the $1,000,000 mortgage made in 1906 asks that the property of the D. & E. be sold under foreclosure, the revenue for the last 11 months not having been more than sufficient to meet operating expenses. The Delaware & Eastern runs from Arkville, N. Y., to East Branch, 35 miles.

Houston Belt & Terminal.—This company has applied to the Texas Railroad Commission for authority to issue $2,200,000 bonds.

Kansas City & Memphis.—This company is to take over the Arkansas, Oklahoma & Western and the Monte Ne Railway about April 10. The lines completed are run from Rodgers, Ark., to Siloam Springs, 31 miles, and from Freeman, Ark., to Monte Ne, six miles. The roads is standard gage 60-lb. rail.

Kansas City, Mexico & Orient.—This company has applied to the Texas Railroad Commission for authority to issue $469,000 bonds, to be secured on 13 miles of road between San Angelo and Mertzon, against which no bonds have as yet been issued.

Missouri, Kansas & Texas.—The $10,000,000 one-year 5 per cent. notes of August 1, 1910, have been called for redemption at par on May 1, 1911.

Monte Ne Railway.—See Kansas City & Memphis.

National Railways of Mexico.—The earnings and expenses for February of the National Railways of Mexico, which earnings are not shown in our weekly table of roads reporting to the Interstate Commerce Commission, were as follows: Gross in 1911, $5,025,832, comparing with gross in 1910 of $4,952,359; operating expenses in 1911, $3,308,694, and in 1910, $3,021,887; net earnings in 1911 $1,717,138, and in 1910, $1,930,473.

New York, New Haven & Hartford.—A bill has been introduced in the Massachusetts legislature providing for the purchase by the Berkshire Street Railway, a subsidiary of the New Haven, of the Springfield Street Railway property.

Pere Marquette.—The Bankers' Trust Company, the Guaranty Trust Company, and White, Weld & Co., all of New York, have bought from the railway and are offering to the public an issue of $1,088,000 equipment trust 5 per cent. bonds of series B, and also an issue of $1,024,000 equipment trust 5 per cent. bonds of series A. Series A mature $64,000 semi-annually, beginning October 1, 1912, and are secured on 2,000 standard box cars purchased under an agreement dated April 2, 1906, and delivered in the ensuing six months, and in addition by the pledge of $375,000 Pere Marquette refunding 4 per cent. bonds. Series B are secured by 2,000 standard box cars delivered in 1906, and the early part of 1907, and by the pledge of $375,000 refunding 4 per cent. bonds. Series B mature $68,000 semi-annually, beginning October 1, 1912. Both series are offered at prices which yield 5¼ per cent. income for all bonds except those maturing in 1912 which are offered on a 5 per cent. basis.

Spokane, Portland & Seattle.—The *Commercial & Financial Chronicle* says that this company, controlled jointly by the Great Northern and the Northern Pacific, voted on January 28 to increase its capital stock from $25,000,000 to $62,500,000, and has now made a new $125,000,000 mortgage, securing 5 per cent. first mortgage bonds of March 1, 1911-1961. The new bonds are to be issued as follows: For corporate purposes, $80,000,000; reserved to acquire stocks and bonds of other companies and interest in terminal and transfer companies, $25,000,000; reserved for improvements, not to exceed $1,000,000 a year, $20,000,000.

Springfield Street Railway.—See New York, New Haven & Hartford.

Wrightsville & Tennille Railroad.—This company, which is controlled by the Central of Georgia, has sold to Jas. H. Oliphant & Co., New York, $100,000 first mortgage 5 per cent. bonds, due 1958. The bonds were subsequently resold. This is part of an authorized issue of $250,000, of which $200,000 are now outstanding, and the sale was made to provide funds to purchase heavier rail, equipment, etc.

Supply Trade Section.

The Chicago offices of the American Locomotive Company, New York, and of the Atlantic Equipment Company, New York, will on April 8 be moved from the Railway Exchange to the McCormick building.

Plans for the reorganization of the Southern Car Company, High Point, N. C., have been completed. J. B. Duke, president of the American Tobacco Company, Jersey City, N. J., and W. G. Brokaw, of New York, have taken the lead in the reorganization.

At the annual meeting of the Bethlehem Steel Corporation, Newark, N. J., the following directors were added to the board: Harry Bronner, of Hallgarten & Company, New York; B. H. Jones and E. C. Grace. The last two directors are associated with the Bethlehem Steel Corporation in an official capacity.

John Langan, of the Okonite Company, New York, has resigned. His retirement from active business to take a much needed rest is due to a recent illness. Mr. Langan is an associate member of the Railway Signal Association, and the standard specification of that association for 30 per cent. compound rubber covered wire was the outcome of a movement started by him.

The annual report of the Western Electric Company, Chicago, shows that the gross sales for the 13 months ended December 31, 1910, were $68,375,150. The cost of production was $63,442,286. Dividends were $1,700,000, and the amount carried to surplus was $1,684,276. The number of orders received in America during this period was 896,000, as compared with 695,000 for the 12 months ended November 30, 1909, an increase of 19 per cent. The value of an order in 1910 was $72 as compared with $62 in 1909.

The United States Metal Products Company, 203-205 West Fortieth street, New York, whose organization was mentioned in the *Railway Age Gazette* of February 17, has plans under way for an addition to its Rapp plant at College Point, L. I., which will involve the erection of a shop, 250 ft. x 600 ft., a dock, 75 ft. x 600 ft., and an employees' bath house, 50 ft. x 60 ft. The officers of the company are as follows: President, John W. Rapp; vice-presidents, H. C. Randall, C. J. Hale and A. J. Connell; treasurer, E. B. Wires, and secretary, C. A. Leonardi.

The Westinghouse Electric & Manufacturing Company, of Pittsburgh, Pa., has just received an order from the Georgia Railway & Electric Company, Atlanta, Ga., for six additional double equipments of No. 112B-2 motors with type K-35 control. The Toledo, Bowling Green & Southern Railway of Findlay, Ohio, has recently placed an order with this company for four quadruple equipments of No. 304 interpole railway motors with latest type HL (hand operated) unit switch control. An order for five double equipments of No. 93-A motors with type K-11-A control has also been placed with this company by the Johnstown Passenger Railway Company, Johnstown, Pa. This company has recently received an order from the Fairmount & Clarksburg Railway Company, Fairmount, W. Va., calling for four additional quadruple equipments of No. 306 interpole motors with HL (hand-operated) unit switch control. The City Railway Company, of Dayton, Ohio, has just placed an order with the Westinghouse Company for ten double equipments of No. 306 interpole motors with type K-36 control. An order for four double equipments of No. 307 interploe motors and type K-35 control has recently been received by this company from the Nashville Railway & Light Company, Nashville, Tenn. The Cincinnati Traction Company has recently placed with the Westinghouse company an order which calls for nine quadruple equipments of No. 303-A interpole railway motors and HL (hand operated) unit switch control. This company has just received a contract from the British Columbia Electric R. R., of British Columbia, for two 45-ton locomotives with quadruple equipments of No. 301 interpole railway motors and automatic unit switch control.

Suffern & Son, certified public accountants, 165 Broadway, New York, have established a department of "effective organization" which will be operated under the direction of Clarke J. Morrison. Its object will be to obtain the most effective organization in manufacturing and other business through the elimination of unnecessary work, expenses or investments and through turning unproductive into productive factors. Mr. Morrison received his early education in the public and high schools at Washington, D. C., and his technical education at Johns Hopkins University and Cornell University, from the latter of which he was graduated with the degree of mechanical engineer in 1901. During the four years intervening between high school and college and during the summer vacations, practical experience was obtained with the Richmond Locomotive Works, Shelbyville Electric Light and Power Company, Buffalo Traction Company, and the Delaware, Lackawanna & Western, as machinist, engineer, and assistant engineer of tests. After graduation he was employed by the Northern Pacific as special apprentice, assistant engineer of tests and material inspector. From December 4, 1903 to June 30, 1909, he was variously employed by the Atchison, Topeka & Sante Fe as machinist, belt foreman, assistant to counseling engineer (Harrington Emerson), material supervisor, general erecting foreman, bonus supervisor and standardizing engineer. From June 30, 1909, to January 1, 1910, he was associated with The Emerson Company as mechanical engineer and from January 1, 1910, to March 17, 1911, worked independently as a consulting engineer in New York.

TRADE PUBLICATIONS.

Frogs.—The Continuous Frog and Crossing Company, St. Louis, Mo., has devoted an unusually well-illustrated catalog to the description and many advantages of the Roach continuous frog. Diagrams are included.

Window Fixtures.—The O. M. Edwards Company, Syracuse, N. Y., has published catalog E on its full line of window fixtures, which are especially adapted to railway use. This catalog contains 60 pages and includes detailed descriptions and minute diagrams.

Metal Culverts.—The Canton Culvert Company, Canton, Ohio, has published the 1911 edition of its catalog on Acme corrugated metal culverts, giving full information on this product and including photographs of installations and also of some strength tests to which these culverts have been submitted.

Derailers.—The Hobart-Allfree Company has just issued catalog No. 110, describing the Smyth and Freeland derailers for hand and mechanical throw. In addition to the descriptions of the various models, instructions for installing the derailers and a number of good photographs of these devices in actual installation are included.

Lighting.—The Cooper Hewitt Electric Company, Hoboken, N. J., has devoted a small booklet to the advantages of the Cooper Hewitt lamp when used in industrial establishments. Bulletin No. 36 was published to supersede bulletin No. 23, and describes the Cooper Hewitt electric lamp, type P, for direct-current automatic lighting.

Motor Car.—Burton W. Mudge & Co., Chicago, recently issued a leaflet on the Adams motor car. This car may be used in track and signal work and will carry three men with the necessary supplies. It weighs less than 300 lbs., and is readily handled by one man. The leaflet describes its construction and service, giving its principal dimensions.

The Cause of Hot Boxes.—McCord & Company, Chicago, printed in its advertisement in the *Railway Age Gazette* of February 10, 1911, a diagram showing the cause of hot boxes. This diagram has been reproduced on a card of convenient size for distribution among railway employees, and the company is offering to supply any quantity to any railway upon request of the proper official.

Titanium Steel.—The Titanium Alloy Manufacturing Company, of Pittsburgh, Pa., has published a 44-page booklet on the subject of Titanium in Steel. Its value as a steel alloy is discussed and acknowledged by various authorities in the iron and steel trade. Its chemical action on the slag and steel and its effect on the physical properties of the steel are described in detail. The book also contains reports of numerous physical and chemical comparative tests made with steels of different

manufacture with and without the titanium alloy. The method of manufacturing the steel from open hearth, bessemer or crucible steels is also given in detail, as well as Rossi's method of securing a titanium content.

RAILWAY STRUCTURES.

ATCHISON, KAN.—The McKinley syndicate which controls a number of interurban electric lines is promoting a new bridge over the Missouri river in which several steam railways have become interested on account of the excessive toll charged on the present bridge. Plans for the new structure have been completed, and its cost is estimated at $400,000.

CASCADE, IOWA.—The Chicago, Milwaukee & St. Paul bridge over the Maquoketa river was burned on March 28. The fire started from sparks dropped by a work train engine.

CENTRALIA, WASH.—The Oregon-Washington Railroad & Navigation Company is having plans made for a station, it is said, to be built at Centralia, at a cost of $25,000. The same company has been ordered by the Washington state railway commission to build a station in Pomeroy, on which work must be started within 90 days, and completed within nine months.

CLEVELAND, OHIO.—The Pennsylvania and the Wheeling & Lake Erie have agreed with the county commissioners to pay $90,000 of the total cost of $110,000, which it is estimated will be required for building a viaduct to carry Dunham road over the railway companies' tracks. The structure will be 48 ft. wide and will have a span of about 800 ft.

GREENWICH, N. Y.—An officer of the Delaware & Hudson writes regarding the reports that improvements are to be made in Greenwich at a cost of $30,000, including a new passenger station, freight house and improving the freight facilities in the yards of the Greenwich & Johnsonville, that details and plans of this work have not yet been made. It is probable that the work will be carried out by the company's men.

MARYSVILLE, CAL.—The Northern Electric is having plans made for a new passenger station, freight sheds and yards, it is said, to be built at Marysville. (November 11, p. 944.)

MOUNT VERNON, WASH.—The Great Northern, it is said, will build a station at Mount Vernon.

NORTH FORK, PA.—See Lock Haven & Jersey Shore (Electric) under Railway Construction.

PORTLAND, ORE.—The Oregon-Washington Railroad & Navigation Company, it is said, is planning to put up a new freight house at Portland.

QUEBEC, QUE.—A press despatch says that the contract for the new Quebec bridge across the St. Lawrence, to replace the partly built bridge which collapsed in August, 1907, has been let to the St. Lawrence Bridge Company by the Minister of Railways and Canals. The contract price is $8,650,000, 15 per cent. of which, or $1,279,500, was deposited with the Canadian government in cash by the bridge company as security. The bridge is to be completed before December 31, 1915. It is to be primarily a railway bridge, but it will have two four foot sidewalks. The St. Lawrence Bridge Company is a combination of the Dominion Bridge Company of Montreal and the Canadian Bridge Company of Walkerville, Ont., both of which guarantee the contract. The St. Lawrence Bridge Company will erect a plant costing $1,000,000 near Montreal to carry on the work.

SALEM, ORE.—The Salem, Falls City & Western is planning to build a bridge over the Willamette river at Salem, at a cost of $100,000. (March 3, p. 436.)

SHELBURN, ORE.—The Southern Pacific, it is said, will enlarge its station at Shelburn.

TOPPENISH, WASH.—The Northern Pacific is planning to build a station and increase its yard and trackage facilities at Toppenish. It is understood that the improvements will cost about $80,000.

VANCOUVER, B. C.—The Canadian Pacific, it is understood, will replace 13 wooden bridges with steel and concrete structures, and will put up 30 new bridges between Vancouver and North Bend.

WINNIPEG, MAN.—Bids are wanted until April 10, by F. Lee, division engineer of the Canadian Pacific, Winnipeg, for building a boiler shop and transfer table at Winnipeg.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Charlotte Harbor & Northern is in the market for 1 passenger locomotive.

The Intercolonial has ordered 4 switching locomotives and 3 passenger locomotives from the Canadian Locomotive Company.

The Salt Lake & Ogden has ordered one 30-ton electric locomotive from the McGuire-Cummings Manufacturing Company, to handle heavy freight traffic. The equipment will include four 100 h. p., 700-volt, d. c., General Electric inter-pole motors with forced ventilation, double and multiple unit control and Westinghouse combined straight and automatic air brakes. The locomotive is designed to handle 400 tons trailing load at 17½ miles an hour on a 0.7 per cent. grade.

The Dominion Iron & Steel Corporation, Sydney, C. B., has ordered 1 mogul locomotive and 1 consolidation locomotive from the Montreal Locomotive Works. The dimensions of the cylinders of the mogul locomotive will be 19 in. x 26 in., the diameter of the driving wheels will be 50 in., and the total weight in working order will be 129,000 lbs. The dimensions of the cylinders of the consolidation locomotive will be 21 in. x 26 in., the diameter of the driving wheels will be 50 in., and the total weight in working order will be 178,000 lbs.

CAR BUILDING.

The Buffalo Creek & Gauley is in the market for 20 hopper cars.

The Chicago, Burlington & Quincy is in the market for 1,000 gondola cars.

The New Jersey Zinc Company, New York, is in the market for 8 gondola cars.

The Mather Horse & Stock Car Company, Chicago, is in the market for from 200 to 300 gondola cars.

The Seaboard Air Line is in the market for 1,000 steel underframe box cars and 200 phosphate cars.

The Canadian Northern has ordered 200 steel underframe flat cars from the Canadian Car & Foundry Company.

The Birmingham & Southern has ordered 55 flat cars, 25 gondola cars and 20 box cars from the Pressed Steel Car Company.

The Intercolonial has ordered 70 thirty-ton box cars and 21 Hart-Otis steel dump cars from the Canadian Car & Foundry Company.

The Charlotte Harbor & Northern is in the market for 25 forty-ton steel phosphate cars and 25 thirty- to forty-ton hopper bottom gondola cars.

The Great Northern, mentioned in the *Railway Age Gazette* of February 24 as being in the market for 15 baggage cars, 10 coaches and 10 combination cars, has ordered this equipment from the Barney & Smith Car Company.

IRON AND STEEL.

The Chicago, Rock Island & Pacific is in the market for 1,700 tons of bridge steel.

The Western Maryland has ordered 4,000 tons of rails from the Maryland Steel Company.

The Harriman Lines have ordered 1,200 tons of rails from the Pennsylvania Steel Company.

The Chicago, Milwaukee & St. Paul has ordered 5,000 tons of rails from the Illinois Steel Company.

The George's Creek & Cumberland has ordered 6,500 tons of rails from the Bethlehem Steel Company.

The Pere Marquette has ordered 700 tons of structural steel from the American Bridge Company, and 500 tons divided be-

tween the King Bridge Company, the Lackawanna Bridge Company and the Wisconsin Bridge Company.

General Conditions in Steel.—The average daily orders of the United States Steel Corporation in the month of March were 35,000 tons. This is a much better showing than was anticipated and brings new bookings in March seevral thousand tons a day above actual shipments. Based on shipments and new orders, a gain of something like 100,000 tons in unfilled tonnage is expected in March. This is in contrast with the estimates made over a week ago that there would be a decrease of from 100,000 to 150,000 tons. The daily average in the first quarter of the year was at the rate of more than 11,000,000 tons a year. When it is considered that the annual production of the Steel Corporation has never exceeded 11,000,000 tons, these figures will be found satisfactory. The falling off in daily orders in March as compared with February is attributed in large measure to hesitancy among buyers because of the impending Supreme Court decisions.

SIGNALING.

The Warthen automatic train stop is being tried on the Buffalo, Rochester & Pittsburg, near Rochester, N. Y. Two locomotives have been equipped for the purpose, and fixtures have been installed on about five miles of the line of the road. The proprietors expect soon to have tests made by the Block Signal & Train Control Board of the Interstate Commerce Commission. The contacting apparatus in this system is arranged above the tops of the cars and engines.

FOREIGN RAILWAY NOTES.

One hundred and fifty-two miles of the government railway lines in Victoria, Australia, have been relaid during the years 1908-1910 with American rails, 142 miles of 80-pound rails and 10 miles of 100-pound rails.

A group of engineers have petitioned the municipal government of Rio de Janeiro, Brazil, for a concession to build and operate an electric subway, connecting the center of the city with the suburbs, similar to those of New York, London and Paris.

An American company will soon undertake the construction of a wharf in the port of Sal, on the Atlantic coast of Honduras; also a railway, which will start from the banana plantations in the northern zone of the republic and terminate at the said wharf.

It is reported that the often-suggested railway between Wuchow, China, and Nanning in Kwang-si is already underway. About $1,000,000 has been subscribed by Chinese born in the United States. The line has already been surveyed and will be about 250 miles long.

Complete electrification of the entire Prussian state system of railways was made certain by the action of the Reichstag at Berlin, when it adopted the railway budget March 28. In the appropriation is an item of $10,000,000 for changing the steam railway line between Magdeburg and Leipzig to electric power. In all 360 miles of railway is affected and this is only the first step in the plans of the Prussian government.

The board of control of the Swiss Federal Railways has approved the construction of a short line of railway between Muenster and Legnan, a station on the line to Biel. The proposed line, the object of which is to pierce the Jura mountains, is to leave Muenster, 1,730 ft. above the sea, and is to run for a great part of its course under the Grenchenberg by means of a tunnel which will be over four miles long, or about half of the total length of the line. The highest point to be attained will be about 1,787 ft. No unusual difficulties are expected, but it is probable that a large amount of water will be encountered. The tunnel will take about four years to complete.

Metallic Doors and Trimmings.

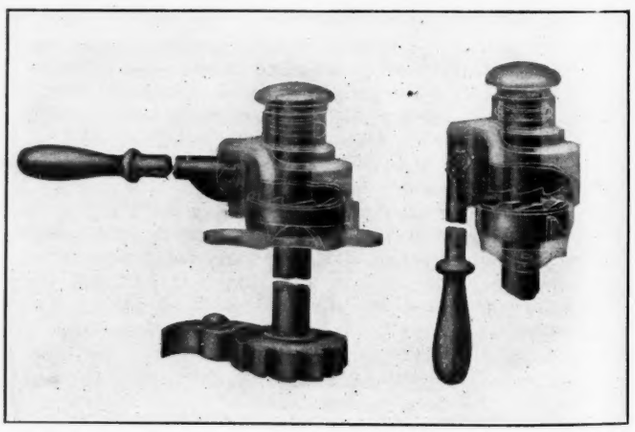
Within the past two weeks the question of fire protection has been brought vividly before the public eye due to the loss of life and loss of millions of dollars by fires in so-called fireproof buildings. There is on record, however, a fire that was held in check by simply closing certain fireproof doors which kept it within the rooms in which it started, thus saving considerable loss of property. This fire took place on September 16 of last year on the twenty-sixth story of the Singer building in New York. The fire-proof doors were made by the Dahlstrom Metallic Door Company of Jamestown, N. Y., and included that company's metallic trimmings, such as sills, etc.

There are so-called fireproof doors which are made of wood covered with tin, but these have proved to be of little protection in a severe fire. Where the sills are made of wood they give no protection whatever, as the sills will quickly burn away and allow the door to fall from its position. In the Dahlstrom metallic door and trim there is absolutely nothing that will burn. They are made of the best sheet steel, of not more than ⅛ in. in thickness and are so well built and neatly finished that it would be hard to tell them from a door made of the wood they imitate. The finish is of special importance and the company will imitate any wood the purchaser may desire. Over one-half the cost of making the door is put into its finish as it takes from 19 to 25 separate operations to give the doors their final finish. That these doors would have proved of great value in the fires on Washington Place, New York, and at the capitol at Albany, N. Y., had they been installed, is without question. The Fire Department's official report on the Washington Place fire stated: "There were two enclosed fireproof stairs with wooden doors and jambs. These doors were consumed by the fire and left the stairs open to the flames."

At present these doors and trimmings are installed in the Singer building; the Grand Central post office, which contains the offices of the New York Central Lines; the United States Express Company building, New York, and many other buildings in which absolute fire protection is of prime importance.

Ratchet Brake Lever.

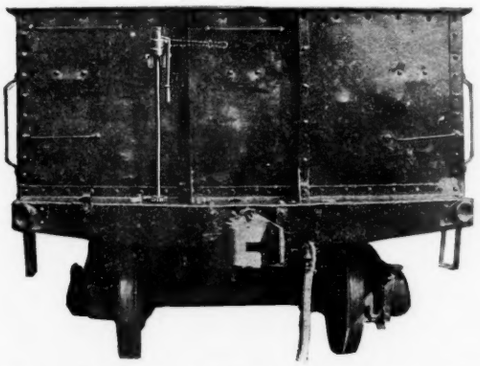
The H-R ratchet brake lever was designed to provide a device that will double the power exerted at the brake shaft and thus do away with the necessity of using any form of multiplying devices. This arrangement is for use on both freight and passenger cars. It is of special interest to the railway world at this time for two reasons; it provides a much more efficient hand brake, and a very simple means of complying with the rulings of the Interstate Commerce Commission which require that on freight cars the clearance between the edge of the brake wheel and the inside face of the knuckle be not less than 4 in. when the horn of the coupler is in its extreme backward travel. The minimum outside diameter of the brake wheel which can be used is 15 in. There are a great many cars in service today on which this clearance does not exist and on which it can not be made to exist without a considerable expenditure. The use of this device, which has an outside diameter of 5½ in., will not only give an efficient brake but will also permit of the cars coming within the rulings referred to in this respect, as it affords ample clearance.



H-R Ratchet Brake Lever.

On gondola cars the foot board is eliminated, since by using a shorter brake shaft the trainman can stand on the end sill to apply the brake. The free revolving cap at the top, which is grasped with the left hand while operating, is a safety device which gives the trainman a handhold in case the chain should break while the hand brake is being applied. A modification of the device for flat cars gives a mechanism that is entirely out of the way and protected whether the car is empty or loaded. It cannot be put out of commission by a shifting load and the brake is also available when cars are loaded with twin loads. The operation of applying or releasing the brake is simple and there are no intricate parts or springs to get out of order. The illustration shows the device attached to a brake shaft in the application position with the teeth in mesh and also in the release position with the teeth out of mesh. The only part attached to the shaft is the lower gear, which is fastened with a pin. The top part of the device is kept from slipping off by a pin through the top of the shaft. The cap is held by a rivet extending through its side and a groove in the top gear casting which allows it to revolve at all times independent of the shaft.

To apply the device it is only necessary to remove the brake wheel, cut off the shaft, drill two holes in the shaft and two in the end of the car, slip the device over the shaft and attach it to the shaft and the end of the car. Any power desired may be obtained by using a length of operating lever to suit. With the usual leverage of 18 in. employed on freight cars a pull on the brake chain of about 2,000 lbs. is obtained, whereas with the 16 in. brake wheel commonly



H-R Ratchet Brake Lever Applied to Gondola Car.

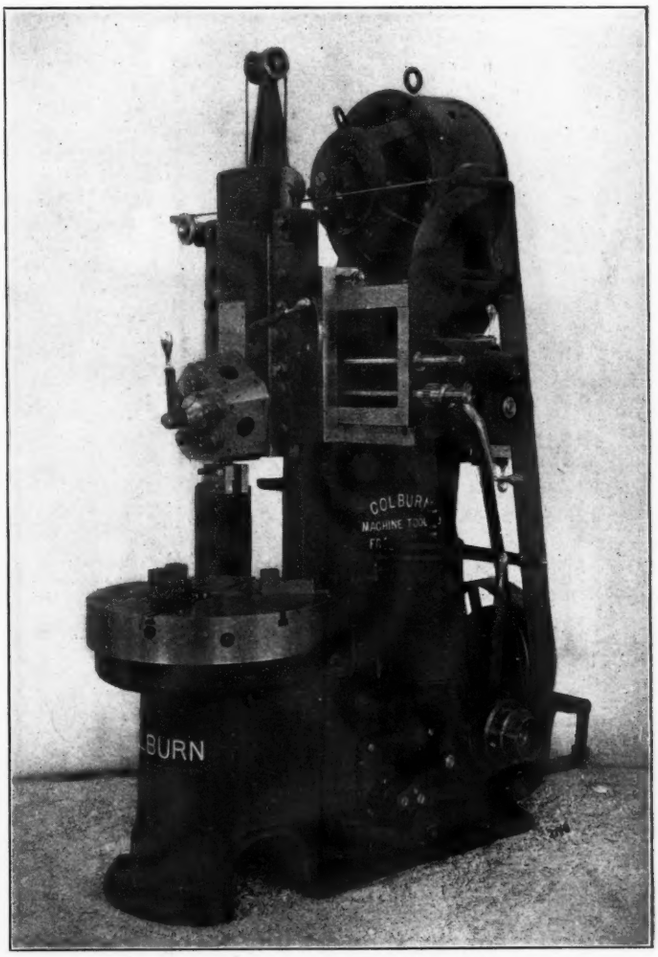
in use a pull of only about 1,000 lbs. can be obtained. By using this ratchet lever the multiplying devices may be dispensed with and we can obtain as much braking power as we obtain theoretically, but not practically, when employing the sheave wheel to double the power. With the sheave wheel eliminated it is only necessary to wind up half the amount of chain and the chance for the chain to foul is reduced to a minimum.

At present the brake shaft must be extended above the top of the car in most cases so that the brake wheel can overlap the car. With this device the top is usually placed below the top of the car, making it impossible for anything to strike the handle or bend the shaft. When the operating handle is lifted the upper gears drop in mesh with the gear attached to the shaft. The brake can then be ratchetted on by moving the operating lever back and forth, the brake pawl at the bottom being operated with the foot as usual. As long as this pawl is in, the brake cannot release regardless of the position of the operating lever. When it is desired to release the brake the operating handle is lifted and a strain is put on the lever so that the brake pawl may be released. The brake chain is allowed to unwind until the lug on the upper ratchet casting engages with that on the bracket casting; the shaft can then unwind no more. The operating lever is then forced down to a vertical position. In doing this the cam on the operating lever strikes the bracket casting, disengages the gears, and allows the shaft to revolve and unwind the chain. This device is in successful operation and is handled by Robert H. Blackall, Farmers Bank building, Pittsburgh, Pa.

Shop Equipment.

Motor Drive for Small Boring Mill.

Manufacturers of machine tools, in many cases, are modifying their designs to include the individual electric motor as an integral part of the machine. Radical changes have been made to secure the best results from the use of the motor. One of the latest designs is illustrated herewith. It is a 30 in. vertical boring mill with a Westinghouse adjustable speed direct current motor. The motor is mounted on a bracket at the top of the machine thus raising it out of the way of the metal chips that fall from the work. It is belted to a friction clutch pulley which replaces the cone pulley used with the belt drive. This clutch is controlled by a lever so that the machine itself may be shut down without



Motor Driven Boring Mill.

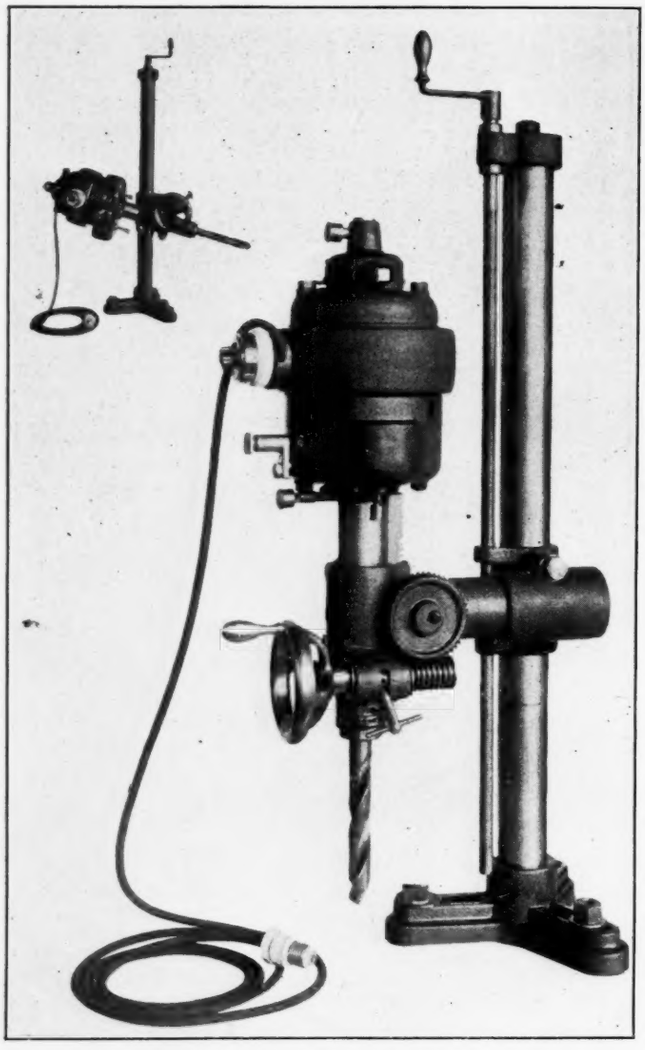
stopping the motor, if but a short stop is to be made. A 4 h. p. adjustable speed Westinghouse type SA direct current motor with a speed range of 400 to 1,600 r. p. m. is used, and its speed is controlled by a Westinghouse drum type machine tool controller with sixteen speed notches. The machine can take work 32 in. in diameter and 16 in. in height, where a chuck is used, and 17 in. with the plain table. There are 16 table speeds ranging from 3 to 106 r. p. m. The turret slide has a vertical travel of 21 in., and may be set at any angle up to 30 degs. on either side of the vertical. A graduated scale attached to the slide is provided to indicate the depth of the holes. The five sided turret has holes 2¼ in. in diameter and also ⅝ in. tapped holes for attaching special tools. In addition to the regular clamping device for the tool holder shanks, special provision is made to keep the tool holders from twisting under heavy cuts. The lock bolt is of hardened steel ground perfectly true, and works

in a hardened and ground steel index ring. Taper gibs of special design allow any wear in the lock nut to be easily and quickly taken up, thus keeping the turret holes in perfect alinement with the main spindle. A friction brake operated by foot power permits the ready stopping of the machine with the table in any desired position. The mill is made by the Colburn Machine Tool Company, Franklin, Pa.

Portable Electric Radial Drill.

A portable electrically driven radial drill has been placed on the market by the Lamb Electric Company of Grand Rapids, Mich. The service of this drill is apparent and its universitality is shown in the accompanying illustration. It will save considerable time on large heavy work that cannot be conveniently handled by large radial drills. It may be clamped to the work as is the ordinary "old-man" and when once clamped is ready for use, the adjustments necessary being the raising or lowering of the drill by the handle at the top, rotating about the steel column or rotating about the drill arm.

The machine will bore holes up to 1 in. in diameter in any postion. Its extreme height is 40 in., the greatest distance

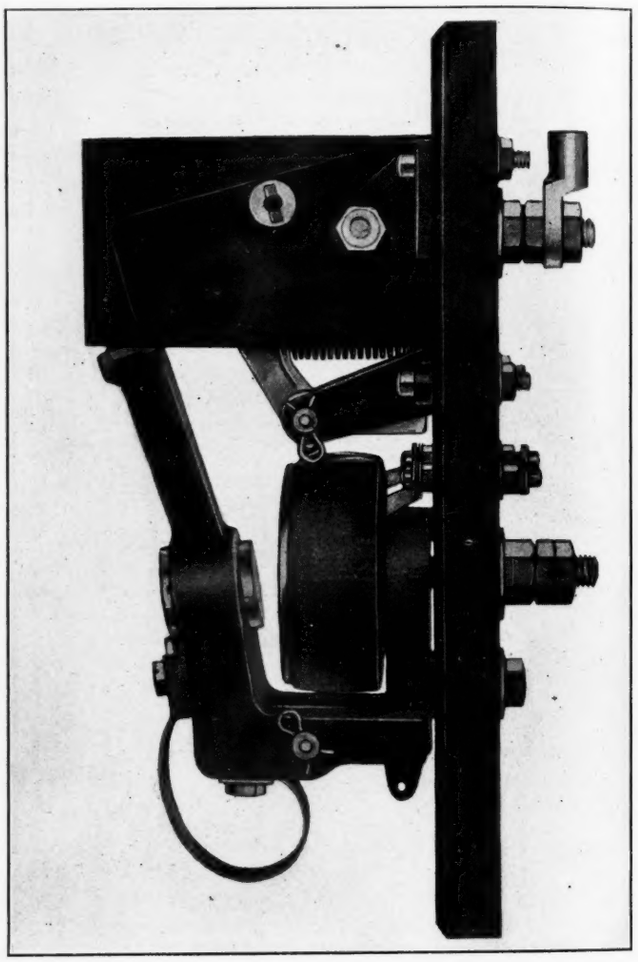


Portable Electric Radial Drill.

from the spindle to the base being 28 in. The largest drilling radius is 8¼ in., but any of these limitations may be made greater to suit special conditons. The column is made of steel tubing 2½ in. in diameter. The spindle has a socket for a No. 3 Morse taper and has a travel of 5 in. by means of a rack and pinion which may be operated by the hand wheel or by power through the worm and wheel as shown. The machine may be equipped with a quick return when so ordered. Two speeds will be furnished if desired and the change from one to the other may be made instantly by shifting a knob. The total weight of the machine is between 130 lbs. and 150 lbs. according to the kind of motor used.

Magnetic Switch for Motor Control.

The Electric Controller & Manufacturing Co., of Cleveland, Ohio, has developed a magnetic switch that is new

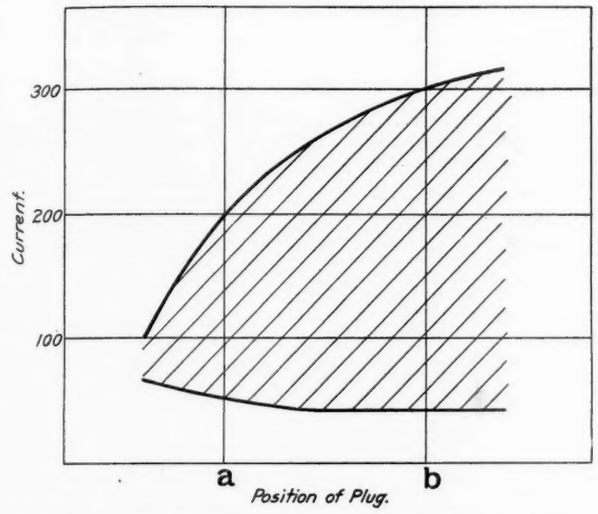


Type S Magnetic Switch.

in principle and operation. It has an operating coil which is connected in series with the motor to be started, the coil being composed of a few turns of heavy wire of fireproof insulation. The switch automatically closes its contacts only when the motor current is below a predetermined value. This controlling feature makes it a combined magnetic switch and current limiting relay; that is, if the motor current exceeds the predetermined value the switch will lock out and will not close until the current has been reduced by the speeding up of the motor. A series of these switches cutting out starting resistance step by step provides a method of motor acceleration which is automatic and protective, and the apparatus is so simple that its expense will not prohibit its application for the starting of any electric motor.

The operating coil is enclosed and protected by a cylindrical iron shell mounted on a slate panel; at the top there are two copper laminated brushes which, when the switch operates, are short circuited, thereby cutting out a section of resistance; at the bottom, a movable plug is provided for adjusting the amount to which current must fall before the switch operates. Screwing in this plug will increase the lockout value and, of course, screwing out the plug will reduce its value. The accompanying chart shows the operating characteristics of the switch. The vertical distances

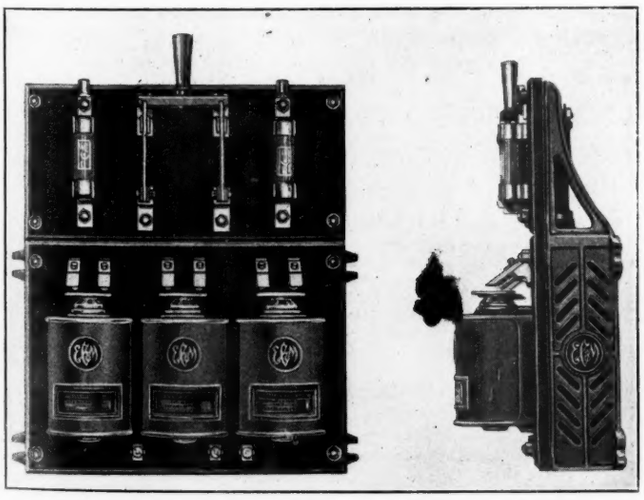
represent the current flowing through the operating coil and the horizontal distances the positions of the adjusting plug. The shaded area indicates the operating limits of the switch. For example if the plug is at position a, the switch will lock out at any current above 200 amperes, but will definitely close as soon as the current falls to 200 amperes. Similarly, with the plug at position b, the switch will lock out at any current value above 300 amperes, but will operate when the current falls to 300 amperes. The bottom of the shaded area



Operating Characteristic of the Automatic Motor Starter.

indicates the minumum current at which the switch is operative although, of course, after it has once closed it will remain closed until the current has dropped to practically zero.

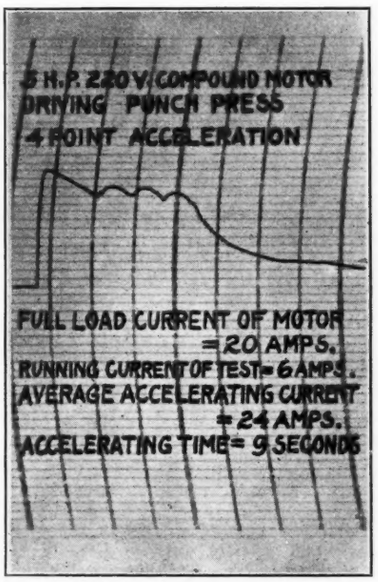
This company has developed a complete line of motor starters embodying the use of this switch. They have been standardized for 110, 220 and 550 volts direct current and over a wide range of horse powers. In order to make them as universally applicable as possible, the starters have been laid out in six different forms, and with various numbers of the accelerating switches. The simplest form consists merely



Series of Magnetic Switches Arranged as a Motor Starter.

of a series of these switches suitably mounted and connected with the starting resistance. These are intended to be used in connection with a knife switch exterior to the starter, but if it is desired, the knife switch may be placed on the starting panel as shown in the illustration. Where the push button or automatic control is desired a shunt-wound magnetically operated switch is used as shown. This starter includes the type S magnetic switch and may also be equipped with an overload cut-out giving complete circuit breaker features; either of these modifications can be furnished with or without knife switches.

The simplest form of these automatic motor starters inherently provides no-voltage protection, for if the voltage fails, all of the switches at once drop out inserting all of the starting resistance in series with the motor and on the return of voltage the motor is automatically accelerated in the normal method. With such a starter it is merely necessary to close the knife switch to start the motor, and to open the knife switch to stop the motor. The acceleration is entirely automatic and will be accomplished in the shortest safe time. A diagram of the starting current, as indicated by a recording ammeter, of a 5 h. p. motor, con-


5 H.P. 220 V. COMPOUND MOTOR
DRIVING PUNCH PRESS
4 POINT ACCELERATION
FULL LOAD CURRENT OF MOTOR
= 20 AMPS.
RUNNING CURRENT OF TEST = 6 AMPS.
AVERAGE ACCELERATING CURRENT
= 24 AMPS.
ACCELERATING TIME = 9 SECONDS

Ammeter Chart Showing Accelerating Current with an Automatic Motor Starter.

trolled by an automatic motor starter equipped with three accelerating switches, is shown. It will be noticed that the current input during acceleration is uniform and does not at any time exceed a safe value. This type of switch, of course, also finds a large application in controller work and the Electric Controller & Manufacturing Company is prepared to furnish it in connection with either reversing or non-reversing controllers for motors of practically any horse power and of the common voltages.

FOREIGN RAILWAY NOTES.

The five "tube" railway systems of London showed total gross receipts of $4,574,043 for last year, the net receipts being $2,306,448. After meeting prior charges, one line continued its dividend of 3 per cent., another its 1¾ per cent., another again skipped a dividend, a fourth paid three-fourths of 1 per cent. against none for 1909, and a fifth line, which paid nothing for 1909, paid 3⅓ per cent. for 1910. The total dividends aggregated $1,182,236.

The board of control of the Swiss Federal Railways has decided to have a second line constructed through the Simplon tunnel. So far traffic has not been sufficiently heavy to warrant the construction of a second line, but the Lötschberg tunnel, with its two lines, is now approaching completion, and the international trains running through it from eastern France and from Germany will connect with the Simplon, with a consequent increase of traffic. The Swiss Federal Railways voted the money necessary to finish the second Simplon gallery as long ago as 1907, and it was expected that Brandt, Brandau & Co., the contractors for the tunnel, would carry out the work; but this has not been done, and tenders are now to be invited for the completion of the second gallery and the laying of the second line.

ANNUAL REPORT

The Delaware and Hudson Company.

GENERAL OFFICE.

NEW YORK, N. Y., March 31, 1911.

To the Stockholders of
THE DELAWARE AND HUDSON COMPANY:

The President and the Board of Managers submit the following statements of the affairs of the company for the year ended December 31, 1910:

The results from operation of the Coal Department were:

Year.	Coal produced and purchased.	Revenue.	‡Expenses.	Net Revenue.
1910	†6,647,659 tons.	$11,806,887.89	$11,764,965.16	$41,922.73
1909	6,238,653 "	16,340,290.43	16,133,836.38	206,454.05
Decrease	*409,006 tons.	$4,533,402.54	$4,368,871.22	$164,531.32

‡ Including taxes.
* Increase.
† Produced only.

The results from operation of the Railroad Department were:

Year.	Miles operated.	Operating revenue.	*Operating expenses.	Net operating revenue.	Percentage of expenses to revenue.
1910	843.46	$20,431,800.43	$12,198,287.13	$8,233,513.30	59.70
1909	843.46	19,525,859.46	11,458,479.58	8,067,379.88	58.68
Increase..	.....	$905,940.97	$739,807.55	$166,133.42	1.02

* Excluding taxes.

RAILROAD DEPARTMENT.

REVENUE AND EXPENSES.

The general distribution of the Operating Revenue and of the Operating Expenses of the Railroad Department was as follows:

REVENUE:	1910.	1909.	Increase or Decrease.
From Coal Freight Traffic.....	$8,724,580.82	$8,311,478.85	$413,101.97
" Merchandise Freight Traffic (including switching).....	8,052,704.99	7,691,617.44	361,087.55
" Passenger Traffic	2,910,025.98	2,834,628.48	75,397.50
REVENUE:			
From Express Traffic	$209,210.11	$205,909.51	$3,300.60
" Transportation of Mails....	119,378.67	125,947.74	—6,569.07
" Miscellaneous Sources.....	415,899.86	356,277.44	59,622.42
Total Operating Revenue..	$20,431,800.43	$19,525,859.46	$905,940.97
EXPENSES:			
For Maintenance of Way and Structures	$1,557,912.63	$1,334,546.21	$223,366.42
" Maintenance of Equipment..	2,842,069.20	2,598,566.26	243,502.94
" Traffic Expenses	249,932.55	227,346.94	22,585.61
" Conducting Transportation...	7,066,049.09	6,821,392.37	244,656.72
" General Expenses	482,323.66	476,627.80	5,695.86
Total Expenses	$12,198,287.13	$11,458,479.58	$739,807.55
Net Revenue from Operation.....	$8,233,513.30	$8,067,379.88	$166,133.42
Percentage of Expenses to Revenue	59.70	58.68	1.02

— Decrease.

Capital Stock and Funded Debt.

Additional Capital Stock of The Delaware and Hudson Company to the amount of $1,000 was issued during the year, in exchange for $2,000 of The Delaware and Hudson Company's Debenture Bonds of 1916.

The amount of Debentures of 1916 shows a reduction of $2,000, two bonds having been exchanged for Capital Stock of The Delaware and Hudson Company.

The outstanding Debentures of 1914 were reduced $200,000, the bonds maturing January 1, 1910, having been paid off and cancelled.

The amount of First Lien Equipment Bonds of 1922, outstanding December 31, 1910, was $9,707,000, bonds aggregating $293,000 having been retired during the year through the operation of the Sinking Fund established in connection with their issue.

The Board of Managers have authorized, subject to the approval of the Public Service Commission, Second District, State of New York, the issue of $7,000,000 of this Company's First and Refunding Mortgage 4 Per Cent. Gold Bonds. The proceeds of these bonds will be applied in payment of the $4,494,320 Floating Debt outstanding on December 31, 1910; in the acquisition of a branch line from Greenwich, N. Y., to Salem Junction, N. Y., and in payment of expenditures which the Board

GENERAL INCOME ACCOUNT OF THE DELAWARE AND HUDSON COMPANY, YEAR ENDED DECEMBER 31, 1910, IN COMPARISON WITH YEAR ENDED DECEMBER 31, 1909.

	1910.		1909.		INCREASE.	DECREASE.
COAL DEPARTMENT:						
Gross Revenue	$11,806,887.89	.....	$16,340,290.43	.....	.....	$4,533,402.45
Gross Expenses (excluding taxes of $316,739.00)...	11,448,226.16	.....	15,832,415.16	.....	.....	4,384,189.00
Net Revenue	.....	$358,661.73	.....	$507,875.27	.....	149,213.54
RAILROAD DEPARTMENT:						
Operating Revenue	$20,431,800.43	.....	$19,525,859.46	.....	$905,940.97	
Operating Expenses (excluding taxes of $497,408.19)..	12,198,287.13	.....	11,458,479.58	.....	739,807.55	
Net Revenue from Operation.....	.....	$8,233,513.30	.....	$8,067,379.88	166,133.42	
OTHER INCOME:						
Hire of Equipment	$196,168.29	.....	$100,611.50	.....	95,556.79	
Outside Operations	Cr. 1,163.08	.....	Dr. 2,684.51	.....	3,847.59	
Dividends and Interest on Securities Owned.....	1,200,565.09	.....	1,088,013.71	.....	112,551.38	
General Interest and Discount.....	563,929.41	.....	504,519.36	.....	59,410.05	
Miscellaneous Items	110,873.81	.....	126,283.67	.....	.....	15,409.86
Total Other Income	.....	$2,072,699.68	.....	$1,816,743.73	255,955.95	
Gross Income	.....	$10,664,874.71	.....	$10,391,998.88	272,875.83	
DEDUCTIONS FROM INCOME:						
Rentals	$2,045,083.70	.....	$2,076,265.96	.....	.....	31,182.26
Taxes	814,147.19	.....	712,889.84	.....	101,257.35	
Interest on 1st and Refunding Mortgage Bonds (1943).	828,160.00	.....	542,253.89	.....	285,906.11	
Interest on 1st Mortgage Bonds (1917).....	350,000.00	.....	350,000.00			
Interest on Debenture Bonds (1916).....	559,001.11	.....	559,061.67	.....	.....	60.56
Interest on 1st Lien Equipment Bonds (1922).....	443,621.25	.....	450,000.00	.....	.....	6,378.75
Interest on Car Trust Bonds (1909).....	.....	.....	2,625.00	.....	.....	2,625.00
Interest on Equipment Debenture Bonds (1914).....	28,000.00	.....	36,000.00	.....	.....	8,000.00
Interest on Divisional Bonds.....	75,000.00	.....	75,000.00			
General Interest and Discount.....	191,672.42	.....	392,678.44	.....	.....	201,006.02
Miscellaneous Items	.....	.....	384.14	.....	.....	384.14
Total Deductions	.....	$5,334,685.67	.....	$5,197,158.94	137,526.73	
Net Income Carried to General Profit and Loss.....	.....	$5,330,189.04	.....	$5,194,839.94	$135.349.10	
Percentage to Capital Stock.....	.....	12.54% on $42,502,000.00	.....	12.22% on $42,501,000.00		

of Managers have authorized to be made on the Company's mortgaged railroad property, at a total estimated cost of $2,208,640.

Sinking Funds.

During the year there was paid into the Sinking Fund under the First and Refunding Mortgage the sum of $207,040, being 1 per cent. of the par value of First and Refunding Mortgage Gold Bonds outstanding on December 31, 1910, making the total paid in to December 31, 1910, $342,430. In accordance with the terms of the trust agreement, this money has been expended in additions and betterments to the property coming under the mortgage.

A Summary of the operations of the Sinking Fund under the First Lien Equipment Trust Indenture, from the date of its creation to December 31, 1910, follows:

RECEIPTS:		
Annual payment to Trustees, years 1908, 1909, and 1910, $650,000 per year		$1,950,000.00
Interest on cash balances and investments		26,748.26
Total		$1,976,748.26
DISBURSEMENTS:		
Thirty-six (36) locomotives purchased	$860,260.32	
Two hundred ninety-three (293) D. & H. First Lien Equipment Bonds purchased and retired (including accrued interest)	298,921.25	
Securities and Cash in hands of Trustees	817,566.69	
Total		$1,976,748.26

At the Annual Meeting of the Stockholders held on May 10, 1910, the ordinance passed on May 9, 1899, authorizing a Sinking Fund, was amended and enlarged so that all amounts or accumulations standing to the credit of the Sinking Fund shall be applied to the cost to the Company of acquiring additional coal lands, either directly or through its subsidiary companies, or to the acquisition of other property needed in the Company's business, or to other capital purposes.

Pending any application of the Sinking Fund, any accumulations thereof and any additions thereto may be invested in the securities of the Company or of any corporation whose railroad the Company may have leased, or upon whose securities the Company may have become liable to pay interest or dividends.

Accordingly, the unappropriated accumulations in the Sinking Fund, amounting to $1,201,538.87 on December 31, 1909, and which were increased during the year 1910 to $1,631,957.96, were appropriated toward defraying the advances to The Schuylkill Coal and Iron Company and the Shanferoke Coal Company for the acquisition of anthracite coal lands in Pennsylvania.

Dividends.

On December 28, 1910, a dividend for the year 1911, upon the outstanding $42,502,000 of Capital Stock of the Company, at the rate of nine (9) per cent. upon the par value thereof, was declared out of the earnings for the current and preceding years amounting in the aggregate to $3,825,180, payable as follows:

Two and one-quarter (2¼) per cent. upon the Capital Stock, in favor only of the stockholders of record upon February 25, 1911, and payable upon March 20, 1911.

Two and one-quarter (2¼) per cent. upon the Capital Stock, in favor only of the stockholders of record upon May 27, 1911, and payable upon June 20, 1911.

Two and one-quarter (2¼) per cent. upon the Capital Stock, in favor only of the stockholders of record upon August 28, 1911, and payable upon September 20, 1911.

Two and one-quarter (2¼) per cent. upon the Capital Stock, in favor only of stockholders of record upon November 27, 1911, and payable upon December 20, 1911.

Taxes Accrued.

Taxes accrued, but not paid, show an increase of $203,969.14, largely due to appeals being taken from the assessments levied by the Tax Assessors, which appeals were still pending on December 31, 1910. The payments of these taxes are held in abeyance pending decisions on the appeals.

GENERAL REMARKS.

Coal Department Operations.

The collieries and washeries of this and subsidiary companies produced 6,647,659 tons of anthracite coal out of a total of 64,905,786 tons produced in the region.

Increase in production of this and subsidiary companies was 448,617 tons and the increase in production of the entire region was 2,935,901 tons.

The Coal Department Expenses include Construction and Betterments amounting to $766,673.73, as follows:

New Engines, New Boilers, Boiler Houses and Fittings	$241,149.37
Sinking Shafts and Shaft Improvements	130,524.87
Rope Haulage, Slopes, Planes and Ropes	112,331.23
Electric Plants and Machinery	44,922.72
New Pumps and New Pump Rooms	40,177.36
Tracks, Locomotives and Compressors	15,774.07
Improvements to Breakers and Washeries	46,347.90
Tunnels and New Openings	51,224.22
Conveyors	21,150.65
Other New Buildings	12,915.09
Miscellaneous	50,156.25
Total	$766,673.73

Taxes of the Coal Department for the year 1910 increased $15,317.78. From June 1, 1909, all coal produced by The Delaware and Hudson Company has been sold to The Hudson Coal Company.

Railroad Department Operations.

The total increase in Revenue from operation was $905,940.97.

The Revenue from Coal Freight traffic increased $413,101.97. The Revenue from Merchandise traffic increased $361,087.55 and from Passenger traffic increased $75,397.50, and that from other miscellaneous traffic increased $56,353.95.

These increases were largely due to the business recovery following the general depression that existed in the anthracite coal business in the latter part of the year 1909 and early part of 1910.

The total increase in Operating Expenses was $739,807.55.

Maintenance of Way and Structures Expenses increased $223,366.42; Maintenance of Equipment Expenses increased $243,502.94; Traffic Expenses increased $22,585.61; Transportation Expenses increased $244,656.72, and General Expenses increased $5,695.86.

At the beginning of the year, the employees of practically every branch of the service, other than those engaged in a clerical capacity, made a general demand on the railways of the United States for an increase in wages, alleging an increased cost of living.

A number of the roads submitted the matter for arbitration under the Erdman Act, approved June 1, 1898, the Hon. Martin A. Knapp, then Chairman of the Interstate Commerce Commission, and the Hon. Charles P. Neill, Commissioner of Labor, acting as arbitrators. In every case an increase in pay was awarded the employees, thus making it necessary for other railways to make similar increases.

The increases granted by this Company averaged about 8 per cent., and became effective about April 1, 1910. The total annual increased wages of employees is estimated at $400,000.

The ratio of Operating Expenses to Operating Revenue for the year 1910 shows an increase of 1-02/100ths per cent. over 1909.

The expenditures during the year on account of Additions and Betterments to the Company's railroad amounted to $697,746.14, details of which are as follows:

Right of Way and Station Grounds	$407,075.03
Real Estate	1,186.27
Grade Reductions and Changes of Line	1,987.46
Bridges, Trestles and Culverts	12,628.73
Increased Weight of Rail	73,470.51
Track Fastenings and Appurtenances	6,317.38
Additional Main Tracks	40,795.67
Sidings and Spur Tracks	43,515.98
Terminal Yards	24,212.82
Improvements of Crossings Under or Over Grade	886.24
Elimination of Grade Crossings	2,532.89
Interlocking Apparatus	4,719.42
Block and Other Signal Apparatus	1,752.36
Telegraph and Telephone Lines	1,335.43
Station Buildings and Fixtures	27,448.97
Roadway Machinery and Tools	510.00
Shops, Engine Houses and Turntables	15,110.21
Shop Machinery and Tools	25,867.27
Water and Fuel Stations (Cr.)	4,912.00
Other Additions and Betterments	11,305.50
Total	$697,746.14

A large portion of the right of way occupied by the Company's railroad in Pennsylvania was originally acquired in connection with purchases of its coal lands, and the cost thereof has heretofore been carried in the balance sheet under Real Estate. To conform with the rules of the Interstate Commerce Commission relative to balance sheet, which were recently promulgated, there has been transferred from the Real Estate account to Road and Equipment account $388,688.50, being the appraised value of that portion of the said lands which are now occupied solely by the Company's railroad.

A contract has been entered into with the American Locomotive Company for the purchase of four (4) Mallet Articulated Compound Locomotives for use on the Pennsylvania Division; also for six (6) ten-wheel locomotives and one (1) Consolidated Locomotive for use on the Chateaugay Branch. The locomotives for the Chateaugay Branch are designed to use either coal or oil as fuel, to comply with the orders of the Public Service Commission, Second District, State of New York, requiring the Company to use oil as fuel on this Branch from April 1st to November 1st in each year.

These locomotives will be paid for from funds accumulated under the First Lien Equipment Trust Indenture.

The Board of Managers have authorized the construction of:

Classified locomotive repair shops, freight car repair shops, coach cleaning and classification yard, and roundhouse terminal at Watervliet, N. Y.

New coal storage facilities, and a plant for transferring coal from open to box cars; and construction of gravity yard at Glenville, N. Y.

Forty stall roundhouse, small electric and steam power plant to handle shops and roundhouse, and change in location of ash pit and coaling facilities at Carbondale, Pa.

Purchase of property for available yard use at Carbondale, Pa.

The estimated cost of the above work is $2,208,640, which will be paid for from the proceeds of the additional $7,000,000 First and Refunding Mortgage 4% Gold Bonds which the Board of Managers have authorized to be issued

During the past four years, the freight car equipment of the Company has about doubled in numbers and capacity and 79 locomotives have been purchased or contracted for, of which ten are of the Mallet Articulated Compound type, and the contemplated additions to the shop facilities of the Company are necessary to take care of the increased maintenance work caused thereby.

Additional yard facilities at Carbondale are needed to facilitate the movement, while the proposed improvements for storing and transferring coal will permit of more economical handling of the freight car supply.

Operation of Allied Steam Railways.

The Greenwich and Johnsonville Railway Company shows an increase in Operating Revenues of $2,310.69 for the year 1910, as compared with

previous year. The Operating Expenses show a decrease of $5,826.88, making an increase in Net Operating Revenues of $8,137.57. The Net Income for the year was $15,289.18, an increase of $3,760.10 over 1909, and is 6.79% on the Capital Stock outstanding.

The Quebec, Montreal and Southern Railway Company shows an increase in Operating Revenues for the year 1910 of $42,611.90 as compared with previous year. The Operating Expenses show an increase of $11,683.95, making an increase in Net Operating Revenues of $30,927.95. The Net Income, independent of interest charges due The Delaware and Hudson Company, amounted to $178,556.74, an increase of $72,697.48.

The Quebec, Montreal and Southern Railway Company (whose entire Capital Stock is owned by The Delaware and Hudson Company) has received from the Canadian Federal Government a cash subsidy of $287,734.55, and from the Quebec Provincial Government a land subsidy of 105,876 acres for that portion of its line between Pierreville and Fortierville recently constructed and which was completed in 1909, $28,265.45 additional will be received upon the settlement of some claims which are now pending.

A portion of the subsidies are alloted to each continuous and uninterrupted ten mile section of railway, in proportion to the cost of construction of the whole line to be completed. In accordance with this policy, The Quebec, Montreal and Southern Railway Company has received subsidies for the completion of five ten mile sections, but as there have been built 55.14 miles, the subsidy on the sixth section has been partly earned but is not due until the completion of an additional 4.86 miles of line.

The Napierville Junction Railway Company shows an increase in Operating Revenues of $8,905.21 for the year 1910 as compared with 1909. The Operating Expenses show an increase of $289.19, making an increase in Net Operating Revenues of $8,616.02. The Net Income amounted to $28,548.52, an increase of $10,867.87, and is 4.77% on the Capital Stock outstanding.

Operations of Boat Lines.

The Champlain Transportation Company shows an increase in Revenue from the operation of steamers on Lake Champlain and Lake George of $13,530.69 for the year 1910 as compared with the previous year. The Operating Expenses show a decrease of $1,064.14. The Net Income amounted to $18,377.63, an increase of $14,300.49.

Hotels.

On May 25, 1910, fire, caused by lightning, totally destroyed the Hotel Champlain, located at Bluff Point, N. Y., on Lake Champlain. The loss was covered by insurance. Both this hotel and the Fort William Henry Hotel, located at Lake George, N. Y., which was destroyed by fire in 1909, are being rebuilt and will be opened for the tourist business during the summer season of 1911.

The new buildings will be constructed of fireproof material, will be steam heated throughout, and practically every sleeping room will be accessible to a private bath. The hotels will be modern in all particulars and will be comfortably, though modestly, furnished.

Electric Railway Revenues.

Increases in Net Operating Revenues were as follows: Hudson Valley Railway Company, $31,874.13; Schenectady Railway Company (including electric express), $94,564.93; Plattsburgh Traction Company, $268.70.

The United Traction Company shows a decrease in Net Operating Revenues of $47,661.22, the Troy and New England Railway Company a decrease of $566.29, and the Mechanicville Power Plant a decrease of $20,424.04. The decrease in the net return of the United Traction Company is mainly due to increase in pay of all employees, and to the unusually heavy fall of snow in 1910, which increased the charges for removal of snow and the cost of Maintenance of Equipment.

Dividends of 4 per cent. for the year 1910 were declared on the Capital Stock of the United Traction Company; 6½ per cent. on that of the Schenectady Railway Company; 4 per cent. on the Capital Stock of the Troy & New England Railway Company, and 5 per cent. on that of the Plattsburgh Traction Company.

Litigation.

In the litigation in respect to the contract under which this Company is operating the Ticonderoga Railroad, the judgment by the Referee, adverse to this Company, has been reversed upon appeal and judgment directed in favor of this Company. The opposing parties have taken a further appeal to the Court of Appeals which has not yet been reached for argument.

After a long trial, the suit brought by Messrs. George M. Hull and others (lessors to this Company of certain coal lands in Pennsylvania), on account of alleged deficiencies in payments of rentals made, is now before the Pennsylvania Court for decision.

Two suits have been instituted against the Company, based on alleged irregularities in the issue of bills of lading and the deliveries of the shipments covered thereby, which suits are being contested by the Company under advice of counsel.

The State of New York has begun suits against this Company and other Railroad Companies operating in the Adirondack Mountain Region for damages alleged to have been suffered by the State Forest from fires caused by the escape of sparks from locomotives, which suits are still pending.

On December 28, 1910, Mr. Archibald D. Russell was elected a Member of your Board to fill vacancy caused by the death of Mr. J. Rogers Maxwell.

By order of the Board of Managers,

L. F. LOREE,
President.

BALANCE SHEET.

Assets.

Items.	1910.	1909.	Increase.	Decrease.
Unmined Coal Owned and Controlled	$16,828,496.90	$18,462,664.86	.....	$1,634,167.96
Advances on Unmined Coal	598,125.72	542,425.78	$55,699.94	
Real Estate	4,730,624.12	5,150,124.36	.....	419,500.24
Road and Equipment—The D. & H. Co	48,838,359.29	47,839,824.94	998,534.35	
Road and Equipment—Canadian Lines	6,287,591.80	6,271,702.56	15,889.24	
Floating Equipment	9,880.00	9,880.00		
Coal Department Equipment, Cars, Motors, Mules, Horses, etc	1,179,953.82	1,074,724.82	105,229.00	
Coal Handling and Storage Plants	270,309.76	267,476.43	2,833.33	
Stocks and Bonds	23,967,687.46	23,588,805.57	378,881.89	
Cash	1,782,372.47	1,850,765.48	.....	68,393.01
Fire Insurance Fund	316,762.85	286,536.26	30,226.59	
Equipment Trust Fund	817,566.69	673,404.79	144,161.90	
Supplies on Hand	2,395,259.85	2,481,726.84	.....	86,466.99
Bills and Accounts Receivable	5,778,401.10	5,803,757.70	.....	25,356.60
Advances for Construction and Acquisition of New Lines	2,020,799.58	1,306,218.85	714,580.73	
TOTAL	$115,822,191.41	$115,610,039.24	$212,152.17	

Liabilities.

Items.		1910.	1909.	Increase.	Decrease.
Capital Stock		$42,502,000.00	$42,501,000.00	$1,000.00	
Bonds as follows:					
1st and Refunding Mortgage Bonds, 1943, 4%	$20,704,000				
1st Mortgage Bonds, 1917, 7%	5,000,000				
The Adirondack Railway Co. 1st Mortgage Bonds, 1942, 4½%	1,000,000				
Schenectady & Duanesburgh Railway 1st Mortgage Bonds, 1924, 6%	500,000				
Debentures, 1916, 4%	13,974,000				
1st Lien Equipment Bonds, 1922, 4½%	9,707,000				
Equipment Debentures, 1914, 4%	700,000				
		51,585,000.00	52,080,000.00	.....	$495,000.00
Loans Payable		4,494,320.00	4,325,000.00	169,320.00	
Interest, Dividends, etc., Accrued		1,066,359.17	1,076,951.67	.....	10,592.50
Interest, Dividends and Bonds due and not yet collected		196,848.10	178,554.60	18,293.50	
Taxes Accrued		310,242.66	106,273.52	203,969.14	
Sinking Fund		.....	1,201,538.87	.....	1,201,538.87
Audited Vouchers and Pay Rolls		3,088,773.52	2,840,346.86	248,426.66	
Other Accounts Payable		181,807.92	220,888.22	.....	39,080.30
TOTAL LIABILITIES		$103,425,351.37	$104,530,553.74	.....	$1,105,202.37
General Profit and Loss, being excess of Assets over Liabilities		12,396,840.04	11,079,485.50	$1,317,354.54	
TOTAL		$115,822,191.41	$115,610,039.24	$212,152.17	